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Factors Predicting Exercise Behavior of Graduate Students

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FACTORS PREDICTING EXERCISE BEHAVIOR OF GRADUATE STUDENTS

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This dissertation, submitted by Bibha Gautam in partial fulfillment of the requirements for the Degree of Doctor of Philosophy from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

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This dissertation meets the standards for appearance, conforms to the style and format requirements of the Graduate Schools of the University of North Dakota, and is hereby approved.

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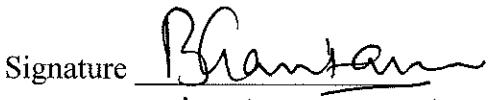
Signature 

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I would like to dedicate this dissertation to the following members of my family especially to my.....

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Mother Narayani Joshi

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ABSTRACT

Graduate school is often experienced as a time of increased demands/expectations resulting in heightened levels of stress due to academic work, family responsibilities, job demands, financial pressure, and other life related issues. Besides stress, graduate school also brings about significant physical inactivity due to the shift of the immediate priority to academic accomplishment. Reports of increasing prevalence of cardiovascular disease (CVD) risk factors among students highlight that this group may have particular risk not well-identified. Yet, relative risk can be reduced by lifestyle modifications, such as eating well, exercising, and stress reduction. The majority of the risk factors, to a great extent, can be controlled by recommended amounts of exercise and physical activity (PA) alone.

This descriptive, correlational study addressed nine research questions dedicated to exploring students' existing CVD knowledgebase, determining their engagement in PA, identifying the motivating and de-motivating factors for exercise, and examining the levels of coping, task, and scheduling self-efficacy. Pender's Health Promotion Model (HPM) along with Bandura's Social Cognitive Theory (SCT) guided this study. A sample of 349 full time graduate students with mean age of 29.5 ± 8.36 completed an electronically delivered survey. Data collection instruments that were included in this 6-part survey included the following: CVD knowledge, personal health behavior, *International Physical Activity Questionnaire* (IPAQ) *Exercise Benefits and Barriers Scale* (EBBS), and *Multidimensional Self-efficacy Scale* (MSES). The contributions of socio-demographic variables to the prediction of PA were also explored.

The students had moderately high to very high levels of CVD knowledge. According to the IPAQ, 11.2% were highly active (>1500 MET-min/week), 67% were moderately active (600-1500 MET-min/week), and 21.8% were inactive (< 600 MET-min/week). Students were more highly motivated than de-motivated to engage in PA. Physical performance, life enhancement, psychological outlook, and preventive health were prominent motivators for PA. Physical exertion and time expenditure were relative de-motivators. Level of study (β= -.134, p= .002) and marital status (β= -.171, p= .000), exercise motivation (β= .133, p= .010), coping self-efficacy (β= .181, p= .001), and scheduling efficacy (β= .347, p= .000) were significant predictors of PA behavior.

The two theoretical models, SCT and HPM, were supported as explanations of PA behavior. PA is an essential component of a healthy life-style. Exercise motivation and self-efficacy are integrally connected with students' PA. Integrating wellness as part of the university's mission may enhance the campus climate, making it more conducive to engagement in PA by students.

CHAPTER I

INTRODUCTION

Graduate school is often experienced as a time of increased demands and expectations resulting in a heightened level of stress due to academic work, family responsibilities, job demands, financial pressure, and other life-related issues (Toews et al., 1997). In addition to stress, graduate school also causes significant physical inactivity due to the shift in the student's immediate priority to academic accomplishment. While exercise and physical activity (PA) remain major cardiovascular disease (CVD) prevention strategies, many studies have reported that student populations (graduate and undergraduate) do not engage in adequate PA (Douglas et al., 1997).

In the face of rapidly rising obesity (30% among young adults between the ages of 20 and 39 years; Ogden et al., 2006), Blair (2009) considers physical inactivity to be one of the most important public health problems of the 21st century. In the United States (US), physical inactivity is challenging tobacco use as the leading indirect cause of death (Mokdad, Marks, Stroup, & Gerberding, 2004). Most adults in the US do not engage in the recommended amount of PA (National Center for Health Statistics (NCHS), 2007). In addition, there is strong epidemiological evidence that links increased psychological stress and increased inactivity to the development of CVD. Yet exercise in terms of moderate PA remains one of the most effective strategies to prevent chronic conditions such as CVD, type 2 diabetes, cancer, and mental illness. Furthermore, exercise is

consistently associated with positive mood by increasing feelings of vigor and reducing tension, fatigue, and confusion (Puetz, O'Connor, & Dishman, 2006). Due to the important role of exercise in disease prevention, the US Department of Health and Human Services released updated physical activity guidelines in 2008. The guidelines recommend that all adults should engage in at least 150 minutes a week (30 minutes, 5 days a week) of moderate intensity or a minimum of 75 minutes a week (25 minutes, 3 days a week) of vigorous-intensity aerobic PA for substantial health benefits. The amount of PA should be increased to 300 minutes of moderate activity or 150 minutes of vigorous activity per week to obtain more extensive health benefits (US Department of Health and Human Services (USDHHS), 2008). The guidelines assure the public that the recommended amount of PA can be achieved by engaging in moderate-intensity, vigorous-intensity, or combinations of moderate-vigorous-intensity PA.

Various motivational theorists agree that exercise and other health-related behaviors are motivational constructs that may vary among individuals based on personal, social, and other demographic characteristics. These motivational constructs could be influenced internally or externally and/or positively or negatively. Positive motivation leads an individual to engage in healthy behavior while negative motivation could serve as a demotivating factor preventing an individual from engaging in exercise and physical activities. Qualitative and quantitative studies have frequently reported lack of time, lack of self-efficacy, lack of social support, and lack of energy as the most commonly reported demotivating factors for exercise and activity by the young student population. Socialization and health benefits are the most frequently cited motivators for exercise (Daskapan, Tuzun, & Eker, 2006).

From a health and well-being perspective, graduate students have been widely studied for their mental well-being in the face of the amount of stress they have, but no studies were readily located that have reported the prevalence of CVD among young, educated adults such as graduate students. As the prevalence of CVD in the general population is increasing, the high prevalence of CVD risk factors among student populations—when combined with data about their negative personal health habits and increased levels of stress—suggests that they may also have increased susceptibility to CVD (Rozanski & Kubzansky, 2005; American College Health Association (ACHA), 2010). This makes it imperative to explore graduate students' existing CVD knowledge base, determine how much of this knowledge is translated into everyday exercise practices, and identify the motivating and demotivating factors that either help or prevent them from engaging in recommended levels of exercise and physical activity.

Statement of the Problem

Currently in the US, more than 81 million people are living with some type of CVD (American Heart Association (AHA), 2010). According to Center for Disease Control and Prevention (CDC) statistics, one in every three Americans has one or more type of CVD (Thom et al., 2006). Increasing prevalence of CVD among young adults is reported and has now become a major public health concern requiring immediate attention (Lenfant, 2001). Even though genetics account for 20% of the risk of CVD (Evans et al., 2003), the risk for CVD is multifactorial. Commonly reported risk factors for CVD are tobacco use, increased cholesterol, elevated blood pressure, physical inactivity, obesity, and diabetes. These behavioral risk factors account for about 80% of all CVD (World Health Organization (WHO), 2009). Psychological stress and anxiety,

also additional risk factors, are known to increase the risk of CVD by increasing the level of cortisol in the body. Chronic negative stressors increased over time may show heightened cardiovascular reactivity that puts people at risk for subclinical atherosclerosis (Low, Salomon, & Matthews, 2009).

Ample evidence exists that the relative risk of CVD can be reduced by lifestyle modifications such as eating well, exercising, and stress reduction. More specifically, the majority of CVD risk factors, to a great extent, are controlled by exercise and activities alone, if carried out as recommended. Despite the strong evidence, a significant proportion of US adults remains sedentary (Spiegel & Alving, 2005); this may be reflected in the fact that less than one third of Americans meet the minimal recommendations for activity as suggested by the CDC, ACSM, and an AHA expert panel (Myers, 2003). During 2003–2004, it was assessed that 66.3% of adults above the age of 20, 57.1% between the ages of 20 to 39, 73.1% between the ages of 40 to 59 years, and 71% of people older than 60 years were overweight or obese based on body mass index (BMI) criteria (Hedley et al., 2004).

It is believed that "Generally, younger, wealthier, better educated individuals under low level of stress and high levels of social support are more likely to practice health-enhancing behavior such as exercising, eating well, and avoiding smoking, and higher level of stress and lower number of resources is associated with health-compromising behaviors" (Adler & Matthews, 1994). Studies have consistently indicated that the prevalence of several major CVD risk factors such as hypertension, total cholesterol, obesity, and smoking rates have been increasing among young adults such as students enrolled in universities (Hajjar & Kotchen, 2003; Ford, Mokdad, & Giles, 2005).

Further, it has been argued that knowledge is the prerequisite for an individual to possess positive attitudes toward implementing certain health-related behavior such as eating well, exercising, and being active (Homko et al., 2008; Jafary et al., 2005; Khan et al., 2006). Further, *CVD knowledge* refers to a basic understanding of the disease process, signs and symptoms, risk factors, and their preventive practices. Among *CVD preventive practices* are regular exercise, being active, smoking cessation, eating well, regular physical checkups, regular screenings for blood pressure and cholesterol, management of diabetes, drinking alcohol in moderation, adequate sleep, and stress reduction. A limited number of studies have examined the knowledge of college students regarding CVD-risk and -prevention practices. Of those, results are varied (Makrides, Veinot, Richard, McKee, & Gallivan, 1998; Almas, Hameed, & Sultan, 2008; Engler, Engler, Davidson & Slaughter, 1992; McFall, Nonneman, Rogers, & Mukerji, 2009; Collins, Dantico, Shearer, & Mossman, 2004). While knowledge is an important factor in motivating individuals toward healthful behavior, other factors need to be taken into consideration. In population-based studies, knowledge factor (Van Der Horst, Paw, Twisk, & Van Machelen, 2007), time factors, social support, exercise self-efficacy, priorities, weather conditions, family commitments, and job-related commitments (Booth, Bauman, Owen, & Gore, 1997; Salmon, Owen, Crawford, & Bauman, 2003; Rhodes & de Bruijn, 2010) are found to be the factors that either motivate or demotivate individuals to engage in physical activity and exercise.

Exercise and moderate physical activity, at recommended levels, could serve as the means to reduce the risk of coronary artery disease, stroke, type 2 diabetes, colon cancer, and breast cancer (USDHHS, 2008). Regular physical activity and exercise also

render benefits beyond physical health by reducing mental stress and increasing an overall sense of well-being (Penedo & Dahn, 2005). Activity and exercise also provide cognitive benefits, including increased brain functioning (Sparling, Giuffrida, Piomelli, Rosskopf, & Dietrich, 2003). Unfortunately, numerous studies have found that students (graduate and undergraduate) do not engage in activity and exercise due to a number of reasons such as lack of time, too much stress, competing demands, and financial constraints. One could consider these issues as de-motivating factors that prohibit students from exercising and being active. It is believed that a better understanding of graduate students' current level of CVD knowledge, the degree to which they engage in exercise and activity for CVD prevention, and the factors that motivate or de-motivate exercise and activity will provide the basis for new and more effective health-promotion activities for these students on US campuses.

Study Purpose

The purpose of this study was to examine the relationships between graduate students' self-reported knowledge about CVDs and their prevention practices, the degree to which the students engage in physical activity, socio-demographic and discipline-related factors, and motivating and de-motivating factors for exercise.

Theoretical Framework

Theory is a "conceptualization of the phenomenon of interest" (Kazdin, 2003, p. 124) that serves as a framework and guides the interpretation of relationships among study variables. Kazdin states that the goal of research is to "understand" a process and that theory provides the underpinnings necessary to bring together "multiple variables and processes" (Kazdin, 2003, p. 129). Albert Bandura's *Social Cognitive Theory* along

with Nola Pender's *Health Promotion Model* (HPM) provide the organizing framework for this study. These two well-established theories are well suited for explaining motivating and de-motivating factors because they are linked to an individual's perception of self-efficacy. In turn, self-efficacy is highly associated with health-promoting behavior such as exercise and PA (McAuley & Mihalko, 1998; Sallis et al., 1986). The HPM depicts the multidimensional nature and interaction of interpersonal, intrapersonal, and physical environments as an individual pursuing health and adopting health-promoting behavior such as PA and exercise (Pender, Murdaugh, & Parsons, 2005). Likewise, *Self-efficacy Theory* maintains that individuals with a high level of self-efficacy or confidence in their ability to perform a given task will be more likely to engage in that task (Bandura, 1977).

Research Questions and Hypotheses

The following research questions and associated hypothesis guided this investigation:

Research Question 1: What is the reported knowledge level of CVDs, CVD risk factors, and CVD-prevention strategies among graduate students?

H1: There will be a moderate amount of knowledge concerning various CVDs, CVD risk factors, and CVD-prevention strategies.

Research Question 2: How much CVD knowledge is translated into actual CVD-prevention practices in terms of physical activity?

H2: There will be no relationship between knowledge of CVD and engagement in CVD-prevention practices.

Research Question 3: What differences in students' CVD knowledge and physical activity behavior exist according to socio-demographic factors and academic area of studies?

H3: There will be no difference in knowledge about CVDs according to socio-demographic variables.

H4: There will be no difference in physical activity behavior according to socio-demographic variables.

Research Question 4: What motivating and de-motivating factors for exercise and PA are perceived?

H5: There are physical, social, and psychological-cognitive factors that either motivate or de-motivate engagement in exercise and PA.

Research Question 5: How much task, coping, and scheduling self-efficacy related to exercise and PA are perceived?

H6: There will be moderate amounts of task, coping, and scheduling self-efficacy related to exercise.

Research Question 6: What is the relationship between the levels of exercise self-efficacy and perceived motivating factors?

H7: There will be no relationship between the level of motivating factors and exercise self-efficacy after controlling for socio-demographic factors.

Research Question 7: What is the relationship between the level of perceived motivating and de-motivating factors and the degree of engagement in exercise and PA?

H8: There will be no relationship between the level of perceived motivating factors and the degree of engagement in exercise and PA.

H9: There will be no relationship between the level of perceived de-motivating factors and the degree of engagement in exercise and PA.

Research Question 8: What is the relationship between the level of exercise self-efficacy and the level of PA and exercise behavior?

H10: There will be no relationship between the level of exercise self-efficacy and PA.

Research Question 9: What are the overall statistically significant predictors of PA?

H11: There will be no significant relationship between PA according to socio-demographic factors, motivating and de-motivating factors, and exercise self-efficacy.

Conceptual Definitions

1. *Exercise self-efficacy*: *Self-efficacy* is defined as an individual's insight into his or her ability to plan and execute actions needed to perform an activity. Such ability of an individual is heavily influenced by past performance and accomplishments (Bandura, 1997). Theoretically, self-efficacy is a cognitive mechanism that mediates behavior change, influences participation in various activities, and determines the amount of effort and degree of persistence in pursuing the activity despite aversive stimuli (LaPier, Cleary, & Kidd, 2009). However, in relation to this study, *exercise self-efficacy* is defined as graduate students' judgment of their capability to engage in exercise and moderate PA as recommended while they pursue their graduate degree.
2. *Physical activity*: PA in this study is operationally defined as any type of body movement produced by the contraction of skeletal muscle that increases energy expenditure above the basal level calculated in terms of MET-minutes according to

the Internal PA Questionnaire (IPAQ) guidelines. The IPAQ suggests three levels of PA: inactivity, minimal activity, and health enhancing PA. *Inactivity* is the lowest level of PA. *Minimal activity* is defined as: I) 3 or more days of vigorous PA for at least 20 minutes per day; II) 5 or more days of moderate PA or walking at least 30 minutes per day; or III) 5 or more days of any combination of activity achieving at least 600 MET-min per week. *Health-enhancing PA* (HEPA) is defined as I) vigorous PA for at least three days a week accumulating 1500 MET-min/week or II) 7 or more days of a combination of any PA achieving a minimum of 3000 MET-min/week. Individuals who do not meet the criteria for minimal activity and health-enhancing PA are considered inactive. The IPAQ has established median MET values for each activity (walking=3.3 METs, moderate PA= 4.0 METs, and vigorous PA=8.0 METs) (IPAQ, 2004). Hence, MET-min/week is computed by multiplying the medium MET level for a specified activity by the minutes and days in a week that PA took place (medium MET value*minutes*days). Forms of physical activities include walking, cycling, gardening, swimming, dancing, playing, skating, cleaning house, and climbing stairs.

3. *Exercise*: Exercise is defined as a subset of PA that is planned, structured, repetitive, and purposeful in the sense that improvement or maintenance of physical fitness is the objective (Caspersen, Powell, & Christenson, 1985). Physical fitness includes cardio-respiratory fitness, muscle strength, body composition, and flexibility comprising a set of attributes that people have or achieve that relates to the ability to perform PA (Thompson et al., 2003). For the purpose of this study, exercise is defined as intentional PA reported by participating students.

4. *Motivating factors for exercise and PA*: These multifaceted factors are the driving forces to help individuals initiate, direct, and maintain exercise and PA. The most common motivational factors for exercise reported in the literature include the desire to maintain health, improve physical appearance, engage socially, and accumulate psychological benefits. Enjoyment is another identified motivating factor (Ryan, Fredrick, Lepes, Rubio, & Sheldon, 1997). Moreover, personal and demographic factors—age, gender, marital status, academic area of study, and level of study—may all influence an individual's perceptions of how exercising and being physically active render benefits. Likewise, existing knowledge about CVD may also control an individual's perception of benefits and barriers of exercising, thus acting as motivating factors. In this study, however, these factors are considered: 1) life enhancement, 2) physical performance, 3) psychological outlook, 4) social interaction, and 5) preventive health as profound motivating factors. These factors were believed to enhance students' exercise-related self-efficacy and eventually their ability to engage in exercise and PA (Campbell, McAuley, McCrum, & Evans, 2001). Below are particular motivating factors:

    a. *Life enhancement*: Life enhancement includes a person's perceptions of positive life-enhancing effects of PA and exercise. Specific aspects of life enhancement include: improved disposition, improved sleep patterns, decreased fatigue, improved self-concept, increased mental alertness, enhanced ability to carry out normal activities without being tired, improved quality of work, and improved overall body functioning due to engagement in exercise and PA.

b. *Physical performance*: Physical performance includes eight elements that motivate people to engage in exercise and PA. These factors relate to the individual's perception of the positive physical performance effects of exercise and PA: improved muscle strength, increased physical fitness, improved muscle tone, improved functioning of the cardiovascular system, increased stamina, improved flexibility, improved physical endurance, and improved physical appearance.

c. *Psychological outlook*: Psychological outlook describes the psychological aspects of motivating factors for exercise and PA. The elements under this factor are enjoyment, stress reduction, improvement in mental health, increase in sense of accomplishment, feelings of relaxation, and sense of well-being.

d. *Social interaction*: This term includes four aspects of social interaction that have been found to motivate people to engage in exercise and PA: a means to establish contacts with friends and others, opportunities to meet to new people, entertainment, and enhanced acceptance of self among others.

e. *Preventive health*: Preventive health-grouped factors motivate individuals to exercise by enhancing the individual's perception of health-preventive benefits such as exercise as a means to prevent heart attack and high blood pressure and as a way to live longer.

5. *De-motivating factors for exercise and physical activity*: These multifaceted factors prevent an individual from engaging in exercise and PA by increasing the perception of barriers to PA and exercise. The most commonly reported de-motivational factors for exercise are lack of time, increased family and academic responsibilities and lack

of energy and self-efficacy. Inadequate resources and social support are other factors reported in some studies. Exercise milieu, time expenditure, physical exertion, and family discouragement are considered four de-motivating factors in this study. These profound de-motivators are thought to have an effect by altering perception of benefits and barriers to exercise and PA. Below are particular demotivating factors:

a. *Exercise milieu*: Exercise milieu includes the following elements as perceived barriers to exercise and PA: direct costs involved with exercise, remoteness, inconvenient schedules, no available exercise facility, embarrassment to exercise in front of other people, and to wear exercise clothing.

b. *Time expenditure*: Time expenditure refers to factors directly related to time taken away from family, school, and other responsibilities.

c. *Physical exertion*: Physical exertion has been rated as one of the most significant de-motivating factors for PA when compared to other factors in some studies (Lovell, Ansari, & Parker, 2010). Physical exertion refers to tiredness, fatigue, and the individual's perception of exercise as hard work.

d. *Family encouragement*: Family encouragement or lack of family encouragement includes lack of support from spouse and other family members.

6. *CVD knowledge*: The *Oxford English Dictionary* defines *knowledge* as expertise and skills acquired by a person through experience or education or the theoretical or practical understanding of a subject matter (2003). For the purpose of this study, *CVD knowledge* is operationally defined as a student's knowledge of CVD or conditions that qualify as CVD, common CVD risk factors, and commonly utilized CVD-prevention strategies.

a. *CVD knowledge* refers to a specific understanding of the medical conditions that come under the umbrella term "cardiovascular diseases," a range of diseases that affect human heart and/or blood vessels such as stroke; heart valve problems; arrhythmia or rhythm abnormality; myocardial infarction, commonly referred to as heart attack; angina; peripheral vascular diseases; heart failure; and aneurysms (AHA, 2004).

b. *CVD risk factor knowledge* refers to an understanding of common modifiable risk factors that make an individual susceptible to various CVDs: tobacco smoking, increased blood cholesterol, increased blood pressure, physical inactivity, obesity/being overweight, diabetes mellitus, excessive alcohol consumption, low daily fruit and vegetable intake, and excessive stress (Yusuf et al., 2004).

c. *CVD prevention practices*: Based on scientific evidence, the WHO suggests the following as the most effective CVD-prevention strategies: limit energy intake from total fats and shift fat consumption away from saturated fats; consume a diet high in fruits, vegetables, nuts, and whole grains and low in refined grains; avoid excessively salty or sugary foods; engage in at least 30 minutes of regular moderate PA daily; avoid smoking and excessive alcohol intake; and maintain a healthy weight (2007). For the purpose of this study, *CVD prevention practice* refers specifically to engagement in moderate PA and exercise on a regular basis as recommended by the *USDHHS* in 2008.

7. *Academic area of studies:* Academic areas of studies are defined as the fields of study of graduate students for the purpose of pursuing higher degrees. These

academic areas of study include but are not limited to humanities, history, linguistics, performing arts, religion, visual arts, social sciences, cultural and ethnic studies, economics, geography, political science, psychology, sociology, space studies, chemistry, physics, computer sciences, mathematics, statistics, business, engineering, education, environmental studies, medicine, exercise physiology, nursing, journalism, mass media and communication, law, and social work. They are grouped in health sciences, arts and sciences, and education and human development.

Summary

The prevalence of CVD among the general population, including young adults, is relatively increasing. Furthermore, the prevalence of several CVD risk factors—hypertension, dyslipidemia, obesity, stress, anxiety, and smoking rates—have risen among university students (Hajjar & Kotchen, 2003; Ford, Mokdad, & Giles, 2005). To date, PA remains one of the most effective CVD-prevention strategies available. Based on available evidence, it is assumed that graduate student populations may collect additional benefits from PA because of its influence of increased feelings of vigor and reduced tension, fatigue, and confusion (Puetz et al., 2006). Thus, besides promoting CVD-prevention benefits, PA may add to students' academic success. Despite reported generalized and specific benefits of PA, studies often report that university students in general do not engage in adequate PA (Douglas et al., 1997). Among these physically inactive student populations, lack of energy, time, self-efficacy, and social support were reported as de-motivating factors for PA.

While informed knowledge base is an important factor for motivating individuals toward healthful behavior such as being active and eating well, other factors need to be

taken into consideration. In population-based studies, in addition to knowledge (Van Der Horst et al., 2007), time factors, social support, exercise self-efficacy, changes in priorities, weather conditions, family commitments, and job-related commitments (Booth, Bauman, Owen, & Gore, 1997; Salmon et al., 2003; Rhodes & de Bruijn, 2010) were all reported as motivators or de-motivators for PA behaviors. Motivational theorists also agree that PA and other health-related behaviors are motivational constructs that vary among individuals based on personal, social, and demographic characteristics. These motivational constructs could be influenced internally or externally and/or positively or negatively.

The mental well-being of graduate students has been extensively studied. But, based on a thorough review of the traditional and "gray" literature sources, no studies that considered graduate studies CVD knowledge and PA were revealed.. Yet the increasing prevalence of CVD risk factors among university students along with their negative personal health habits and increased stress levels may increase their susceptibility to CVD (Rozanski & Kubzansky, 2005; ACHA, 2010). Careful consideration of the available evidence makes it imperative to examine graduate students' existing CVD knowledge and determine how much of this knowledge translates into everyday PA behavior. Further, it is critical to identify the motivating and de-motivating factors for PA as perceived by these students.

CHAPTER II

REVIEW OF LITERATURE

This chapter presents a review of literature relevant to the phenomena of interest identified in chapter one. The review focuses on nine major areas: the concept of the burden of CVD, the status of cardiovascular disease among young people, the general risk factors for cardiovascular disease, including psychological stress, anxiety, and depression as risk factors, psychological stress in the graduate student population; PA and its role in cardiovascular disease risk reduction, the student population and physical inactivity; and motivating and de-motivating factors for exercise and activities. The review concludes with the discussion of social cognitive theory and the health promotion model as the guiding frameworks for this study.

Current Burden of Cardiovascular Diseases

The World Health Organization WHO (2010) defined CVD as a broad term that includes coronary heart disease (CVD), stroke, inflammatory heart disease, rheumatic heart disease, and hypertensive heart disease. The American Heart Association (AHA) (2004) definition of CVD includes the following parameters: coronary heart disease, stroke, high blood pressure, and rheumatic heart disease.

In 2003, approximately 17 million deaths due to CVD were reported among all deaths in the world (Mackay & Mensah, 2004). By the year 2020, it is estimated that CVD will continue to rise and be the single, most common cause of death and disabilities in the world (Critchley & Unal, 2004). In the United States, CVD prevalence among

adults ages 20 years and older was 36.3% while the mortality data in 2005 showed CVD to be the underlying cause of death accounting for 35.3% of all deaths (Rosamond et al., 2007).

The prevalence of CVD clearly increases with advancing age with some variations according to race, ethnic, geographic, and socio demographic characteristics of the population groups. Despite the age hypothesis, the younger population has also felt the impact of CVD; it remains on the top five causes of death amongst individuals between 20 and 45 years of age (Centers for Disease Control (CDC), 2005). Moreover, the prevalence rate is also associated with the income level, employment status, and state/territory of residence (CDC, 2005).

Yet, by 2020, the American Heart Association (AHA) seeks to improve the cardiovascular health (CV) of all Americans by 20% while reducing deaths from CVD 20% (Lloyd-Jones et al., 2010). In order to meet this broader goal of improving the CV health, the AHA defines the ideal CV health as one of the following: 1) the simultaneous presence of four favorable health behaviors (abstinence from smoking within the last year, ideal body mass index, PA at goal, and consumption of a dietary pattern that promotes cardiovascular health; 2) the simultaneous presence of four favorable health factors (abstinence from smoking within the last year, untreated total cholesterol < 200 mg/dl, untreated blood pressure <120/<80 mm Hg, and absence of diabetes mellitus; 3) the absence of clinical CVD (including CHD, stroke, heart failure, etc)." In order to satisfy the requirement of ideal CV health, the AHA outlined seven health behaviors; 1) currently not smoking or quit within 12 months, 2) BMI less than 25 kg/m^2, 3) PA $\geq$150 min/wk moderate intensity or $\geq$75 min/wk vigorous intensity or 4) healthy diet; 5) total

cholesterol <200 mg/dl, 6) blood pressure <120/<80 mm Hg, and 7) fasting plasma glucose <100 mg/dl.

Status of Cardiovascular Disease Risk among Young People

The availability of published literature in the United States that reports the prevalence of CVDs among young adults is limited despite the occurrence of CVDs among young adults at an alarming rate. Thus far, published research on student populations is even scarce. There are very few published studies that have pointed out that university students have increased risks of having CVD due to elevated blood pressure, increased cholesterol, prevalence of smoking, unhealthy food choices, consumption of alcohol, inactivity, and/or lack of knowledge about CVD (Greenlee, Castle, & Woolley, 1992; Spencer, 2002; Collins, Dantico, Shearer, & Mossman, 2004; Frost, 1992).

Greenlee, Castle, and Woolley (1992) evaluated CVD risk status of freshman medical students (n=89) in order to design educational interventions to change students' behavior to modify their CVD risk status. Additionally, their objective was to improve the students' knowledge and attitude toward preventive cardiology over four years of medical training to assist them to adopt best CVD prevention practices for their patients in the future. They used a one group, pretest posttest design and the sample consisted of 91% white, 84% male and 53% married students. Of the 77 students completing initial risk evaluation during freshmen year, 84% had some modifiable risk factor, almost 50% had at least one major modifiable risk factor (smoking, high blood pressure, high cholesterol), and almost one third of the students had one major modifiable risk factor in addition to one minor modifiable risk factor (increased body fat, physical inactivity, and

increased stress). Surprisingly, when the students' risk evaluation was done again during their senior year, 62% of the students still had at least one modifiable risk factor despite statistically significant changes in the prevalence of CVD risk factors.

A more comprehensive study of CVD risk assessment within a student population was conducted by Spencer in 2002. This study measured cardiovascular risk factors in 226, 18-26 year old traditional college students. The sample was comprised of 57% female and 84% white students. The aim was to report the magnitude of the problem of CVD risk factors among traditional college students. Results demonstrated that 29% of these college students had undesirable total cholesterol level greater than 200mg/dl. An HDL level of below 40 mg/dl was present in 18.7% of the students. Borderline measures of blood pressure were set as 130 mm hg systolic and 85 mm hg diastolic; 21.3% had high systolic and 15.6% high diastolic blood pressure. More than 50% of the participating students acknowledged that at least one of their biological parents had high blood pressure and/ or high cholesterol. More than 50% reported consuming a diet high in fat. The number of students reporting to be engaged in binge drinking (5 or more drinks in one sitting more than once a week) was 18%. More than 50% of the students also reported that they experienced variable levels of stress, and 14% of the students identified themselves as smokers. Out of 32 smokers, 57% reported smoking greater than 20 cigarettes in a week. Out of 220 students, 46% of the students reported exercising less than twice a week. There were gender based differences in the prevalence CVD risk factors with men being at greater risk. The author claimed that efforts are needed to develop effective screening and education programs for behavior change in the areas of alcohol, diet, tobacco use, stress and exercise among college students (Spencer, 2002).

Some studies have published staggering statistics of the presence of health related risk factors among college students. Between 2005 and 2009, Burke, Ruth, Reilly, Morrell, and Lofgren (2009) conducted a cross-sectional study of 1701 students enrolled in an introductory nutrition course at the University of New Hampshire. The sample was comprised of 28% males and 72% females between 18 and 24 years of age. One third (33%) were either obese or overweight, 53% had elevated LDL cholesterol, 47% elevated systolic blood pressure, and 39% elevated diastolic blood pressure. Eight percent of the male students had indicators of metabolic syndrome. Yet, 28% students reported being engaged in less than 30 minutes of PA each day. Additionally, the majority of the students reported eating a diet high in sodium. Yet only 5% identified themselves as smokers. These finding reinforced the idea that problems of obesity and lack of PA leading to increased vulnerability for chronic illnesses are significantly prevalent among college students.

Collins, Dantico, Shearer, and Mossman (2004) conducted another large-scale exploratory study of 1,481 students over the age of 18 years enrolled in selected undergraduate courses at Arizona State University. Their findings suggested that students in general have both a low risk perception and low level of knowledge about their risk of having CVD. There were ethnic variations in CVD knowledge, with cancer identified as the number one health risk by 47% Caucasian, 35% Hispanic, and 42% African American students. Over a third of Asian (34%) and Native American (39%) students recognized heart disease as their greatest health risk. Caucasians were seen as being at highest risk for developing CVD. Over three-quarters (77%) stated they did not receive information about CVDs but 75% acknowledged receiving information about

other diseases such as cancers. These findings emphasized the importance of educational interventions in increasing awareness of self perception regarding the risk of CVD.

Frost reported different findings in 1992 from a cross-sectional survey of 1,503 four-year public liberal arts college students' knowledge, attitudes, and behaviors regarding CVD risk. The study had a response rate of 60.4%, 56.2% seniors, 10.3% juniors, and 0.5% graduate students. High percentages were aware of high blood pressure as a key risk factor for CVD (91%) and identified smoking (90%), high cholesterol 86.7%) and physical inactivity (72%) as other risk factors. More than 72% of the students believed that exercise has a significant effect in preventing CVD. Although 96% indicated their willingness to exercise as prescribed and 72.3% were confident in their ability to exercise, only 33.5% reported that they exercised regularly during the previous week. Frost noted discrepancies between knowledge and implementation of CVD prevention practices. The above review of available literature on the CVD risk factors among college students is alarming in its implications. The prevalence of specific risk factors such as elevated blood pressure, dyslipidemia, and obesity when combined with lack of adequate knowledge about CVD and the inclusion of behavioral risk factors such as increased inactivity, nutritional imbalances, smoking, and alcohol intake, in the equation warrant further investigation.

General Risk Factors for Cardiovascular Diseases

For the past few decades, the medical community has claimed that obesity has a causal relationship toward the onset of CVD. The public gradually became aware that their CV system could be negatively influenced by faulty lifestyle habits and genetic risk factors. Consequently, the major health organizations started to suggest hypertension,

dyslipidemia, obesity/overweight, diabetes, smoking, physical inactivity, and heightened stress level may all increase an individual's risk for developing CVD (AHA, 2006). Hence, social contextual factors such as low socioeconomic status, adverse employment conditions, family/marital life situation, caregiver role strains, and inadequate social support may produce a great deal of stress among populations (Hoppmann & Klumb, 2006; Jacobs et al., 2007). An adverse relationship has been found to exist between these stress situations and physiological/psychological demands on human body as manifested by elevated blood pressure, increased cholesterol, increased heart rate, decreased job satisfaction, and increased rates of health risk behaviors such as smoking and consumption of alcohol (French & Caplan, 1972).

The most commonly reported CVDs are coronary heart disease (CHD), stroke, peripheral vascular diseases and rheumatic heart disease (AHA, 2006; WHO, 2004). Although there are different types of CVDs, their risk factors are roughly identical. For example, the risk factors for high blood pressure include age, family history, obesity, physical inactivity, smoking, high-sodium diet, excessive alcohol intake, and increased stress level. Thus far, most of the CVDs are related to advancing age, family history, obesity, physical inactivity, smoking, high blood cholesterol, high blood pressure, and diabetes mellitus (AHA, 2005; WHO, 2004; National Heart, Lung, and Blood Institute, 2006). Furthermore, most CVDs and hypertension share psychological elements (stress, depression) as their risk factors. Finally, age, personal and family history, high blood pressure, smoking, diabetes mellitus, coronary heart disease, high blood cholesterol, physical inactivity, and excessive alcohol have all been designated as risk factors for stroke. Therefore, CVD has been considered as a group of diseases which includes

myocardial infarction, peripheral vascular diseases, hypertension, and stroke, that all share common risk factors (AHA, 2006; NHLBI, 2006; WHO, 2004).

More specifically, the risk factors for CVD are categorized into two major groups; modifiable and non-modifiable risk factors. Age, gender, race, and heredity are grouped to form non-modifiable risk factors; major modifiable risk factors include high blood pressure, dyslipidemia (high total cholesterol, LDL-C and triglyceride levels, and low levels of HDL-C), tobacco use, physical inactivity, obesity, unhealthy diets, and diabetes mellitus. Additionally, minor modifiable risk factors include depression, psycho-social stress, alcohol use, and use of certain medications. More recently, contextual factors have also been added to the list (Appel, Harrell, & Deng, 2002; Le, Chongsuvivatwong, & Geater, 2008).

Thus, a number of risk factors contributing to CVD morbidity and mortality have been identified through epidemiological and sociological studies. The overall risk factors identified are grouped into two major categories: modifiable risk factors and non modifiable risk factors. Studies have further suggested that most of the risk factors for CVD to some extent are modifiable through simple lifestyle choices.

Psychological Stress, Anxiety, and Depression as Risk Factors for CVD

Psychosocial stress commonly refers to interpersonal, social, familial, and societal factors that are responsible for producing anxiety in an individual (Lazarus, 1966). A substantial link between consistently elevated levels of stress, anxiety, and depression to the development of CVD has been reported by multiple authors. In a review of more than 250 published works in psychological, social, and biomedical fields, Rozanski and Kubzansky (2005) examined the association between psychosocial stress and coronary

artery disease (CAD) development. They defined psychosocial stress to include depression, anxiety, personality factors, social isolation, and chronic life stresses. Their findings strongly suggested that the psychosocial state of an individual may contribute to a greater frequency of adverse health behaviors such as poor diet, low self esteem, and smoking. Furthermore, psychosocial state was also found to have a strong association with development and/or promotion of CAD through direct pathophysiological mechanisms such as neuroendocrine and platelet activation. The psychosocial state of an individual was found to contribute to CVD in three distinct ways: 1) directly promoting the pathogenesis of atherosclerosis, 2) indirectly contributing to maintenance of unhealthy lifestyle behaviors, such as smoking and poor dietary habit, and 3) indirectly rendering an important barrier to successful modification of lifestyle behaviors in the presence of coexisting psychosocial stresses once the clinical CAD is developed.

Other reviews have agreed with that of Rozanski and Kubzansky (2005). They also demonstrated an association between stress, anxiety, depression, and CVD. Hamer, Molloy, & Stamatakis (2008) conducted a recent prospective study to estimate the extent to which behavioral and pathophysiological risk factors account for the association between psychological distress and incident cardiovascular events. Their sample consisted of 6,576 healthy men and women with a mean age of 50.9. They measured three domains of CVD: participants' psychological factors (happiness, anxiety/depression symptoms, and sleep disturbance), behavioral risk factors (smoking, alcohol, and PA), and pathophysiological risk factors (C-reactive protein, fibrinogen, total and HDL cholesterol, obesity, and hypertension) at baseline. The major CVD outcome measures in the study were hospitalization related to nonfatal myocardial infarction, coronary artery

bypass, angioplasty, stroke, heart failure, and related mortality. At baseline, 14.6% of participants showed psychological distress; distressed subjects were more likely to have poorer health behaviors, higher levels of inflammatory and haemostatic markers, greater prevalence of hypertension. Psychological distress was significantly correlated with cigarette smoking, physical inactivity, alcohol intake, CRP, and hypertension. A linear relationship was found between psychological distress and CVD events as outcome variables, indicating that psychologically distressed participants were at a higher risk of having CVD events during follow-up. There were 223 incidents of CVD events over an average follow-up period of 7.2 years. The study results strongly suggested that the risk of CVD increases in the presence of psychological distress.

Additionally, an Expert Working Group (EWG) of the National Heart Foundation of Australia published an account of systematic reviews of the evidence relating to psychosocial risk factors and their relation to development or progression of CHD. Their review was based on extensive search of databases such as Medline, Embase, and Psych-info. The final review included 15 case–control and prospective studies. The group suggested that there may be an independent causal association between depression, social isolation, and lack of social support and the causes as well as the prognosis of CHD. These psychosocial factors were noted to be equivalent to the conventional risk factors for having CVD such as smoking, dyslipidemia, and hypertension. Yet the group denied the equally strong association between CHD and psychosocial factors such as chronic life events, work-related stressors, hostility, and anxiety disorders (Bunker et al., 2003).

Although associations between psychological factors and CVD risk have been established, the exact pathophysiological mechanisms are still under rigorous

investigation. One of the mechanisms frequently argued by numerous biomedical studies is the cortisol mechanism. Biomedical evidence strongly suggests that a persistently high level of psychological stress increases the level of cortisol in the body; this in turn is positively correlated with adverse CV events such as elevated blood pressure, increased insulin resistance, and increased plasma triglyceride concentration (Phillips et al., 1998; Raison & Miller, 2003). A negative correlation also was found between cortisol and high density lipoprotein. The nature of these correlations suggests an existence of correlations between psychosocial stress, cortisol level, and adverse CV events.

This section reviewed the relevant literature concerning the association between psychological stress, anxiety, and depression as general risk factors for CVDs. Although many of these studies were conducted among populations other than college students, the findings could clearly be translated into the occurrence of incidences of CVD events among these young adults due to universal nature of bio-physiological functioning of human system.

Psychological Stress within the Graduate Student Population

Studies have shown that the increased stress of academia can have a negative impact on a student's academic performance and can lead to anxiety, depression, and decreased well being (Frazier & Schauben, 1994). Four key factors that often impact the lives of students creating variable level of stresses are academic factors, demographic factors, psychological factors, and human/cultural factors (Sigafus, 1998). Researchers have reported that graduate school is often experienced as a time of increased demands and expectations resulting in heightened level of stress produced from academic work, family responsibilities, job demand, financial pressure, and other life related issues

(Toews et al., 1997; Silber et al., 1999). Graduate students frequently report their current level of stress to be above average or in some instances the highest in their lives (Pfeifer, Kranz, & Scoggin, 2008). Researchers have frequently remarked upon the importance of supportive relationships between faculty and fellow students in academic life (Pauly, Cunningham, & Toth, 2000). Pauly et al. (2000) further noted that a significant number (40-50%) of the students enrolled in graduate degree program especially at doctoral level do not graduate (Dorn & Papalewis, 1997). For doctoral students, the major reason for not being able to graduate was the devastating effect of doctoral programs, which made them depressed and often times suicidal (Lovitts, 2010).

Similar results were found by other researchers. Some looked at overall stress level among student populations while others looked at other components such as social support or spiritual well being. Calicchia and Graham (2006) examined the relationship between stress, spirituality, and social support in 56 graduate students (women= 41, men= 15) pursuing a master's degree in counselor education in southeastern Massachusetts. The majority of students was Caucasian and reported a median income of $28,000. The results postulated that the students involved in rigorous academic and clinical programs frequently experienced a high level of stress due to increased workload and competing demands. These students were concerned that they did not have enough time to engage in stress reduction activities in social and personal venues. The findings provide an impression that the graduate students are at a greater risk of developing physical and psychological health problems as a result of the increased stress and inability to engage in stress reduction programs.

Hyun, Quinn, Madon, and Lustig (2007), conducted a cross sectional survey of 3,121 full-time domestic and international graduate students at a large western university. The students completed an online survey with a response rate of 33.8%. The mean age of the sample was 28.8 years, females comprised 53.3% of the respondents, the majority were doctoral students, and the greatest percentage of students (40.4%) represented the science and engineering disciplines. The remaining students were distributed among professional schools (26.4%), social sciences (19.6%), the humanities (11.4%), and other programs (2.1%). An emotional or stress related problem significantly affecting their well-being and academic performance during the past year was report by 44% of the international and 46% of the domestic graduate students. Furthermore, 58% of the students also reported having a friend with stress-related problems. There were gender differences, with only 39% of male students reported having these problems compared to 52% of females.

A nationwide survey of 404 graduate students commissioned by Grad Resources, reported similar findings (Barna Research Group, 1999). The findings of this telephone survey were in agreement that graduate school is a period of increased stress and anxiety in students'life.The majority of the students in this study reported encountering a constant struggle to achieve a balance in their lives, affecting their academic as well as private lives The students were gravely concerned about their personal health Many students noted that pressures of graduate school were taking an emotional toll on them. Some of the challenges experienced by these students were; balance outside of school (70%), personal health (59%), dealing with stress/burnout (55%), not being successful in career (52%), financial pressures (46%), and peer relationships (40%).Some other

concerns were choosing the wrong career path, relationships with professors, failing others' expectations, and feeling like an outsider. The demographics of the study participants were not disclosed in the report.

A study of 53 doctoral students by Nelson, Dell'Oliver, Koch, and Buckler (2001) also noted that the majority of the students reported scholastic coursework, dissertation work, and financial situation as major sources of stressors in their academic life. The study participants, evenly distributed between males and females, were students enrolled in clinical psychology coursework in a small university in the northwest. Students' reported stress levels, psychological health, social support, and coping styles were measured. Other stressors were internship expectation, practicum placement, hassles of daily life, and time management. Besides academic performance, all of these factors were often strongly linked to students' mental and physical health consequences. Statistically significant differences in the stress level were found among males and females with females reporting comparatively greater amount of stress related to time management.

Stecker (2004) reported graduate/professional students to have symptoms of depression, stress, and substance use at a very high rate. The study involved both graduate and undergraduate students (n= 667) from across the disciplines including nursing, medicine, dentistry, and pharmacy. An alarming number of students reported symptoms of depression during the previous 4-week period. At least five symptoms of depression were reported by 10% of students and suicidal thoughts were reported by 10%. McKinzie, Altamura, Burgoon, and Bishop, (2006), reported a high correlation between stress, sleep patterns, and exercise habits, and negative mood state among

psychology graduate students. They studied 65 students, 49 women and 16 men with a mean age of 27 years, enrolled at one university in the New York City Metropolitan area. The purpose of the study was to explore the correlates and predictors of stress among students at doctoral level. They found that students' stress level was significantly correlated with their sleeping patterns, exercise habits, and negative mood state. This study disseminated a mixed message about graduate students' health related behaviors. On one hand the students reported greater adverse mood states and sleep deprivation with fewer hours of sleep. Yet students who were stressed reported engaging more in exercise episodes. The study results may have been limited by the over sampling of females (75%) and Caucasians (88%) and utilization of a positively skewed stress scale.

Graduate students have also been studied qualitatively. Johnson, Batia, and Haun (2010) examined perceived stress level among graduate students in regard to their roles, responsibilities, and social support. Twelve graduate students provided responses regarding personal and academic responsibilities, current stress levels, and coping strategies they employ. The majority of the participants experienced role conflict between academic and personal responsibilities and perceived difficulty in balancing these responsibilities; the result was increased stress levels. These students acknowledged that changes in graduate students' levels of social support upon entering graduate school prevented them from using it as a means of coping with the stress. In another qualitative study, Stratton, Mielke, Kirshenbaum, Goodrich, and McRae (2006) addressed graduate students' quality of life and the types of support system they needed. They used a heuristic approach to study 16 students currently enrolled in the College of Education. The participants were traditional graduate students in their twenties (n=11)

and nontraditional graduate students in their thirties, forties, and fifties (n=5). Eight were pursuing master's degrees and eight doctoral degrees. Students rated their current level of life satisfaction, an average of 4.75 on a scale ranging from 1 (very low) to 6 (very high). Although the students' current levels of stress were not measured, 100% of the students expressed that they needed additional support from their family and friends to achieve their academic goals due to increased stress level.

These studies reported varying level of stress and coping across the students based on age, gender, level of study, and area of study. Studies have consistently found that graduate students in general are more stressed and women experience higher levels of stress than their male counterparts. Some studies compared the stress levels of students based on academic field of study and found that students in some areas of study experience more stress than others. Some studies additionally reported that graduate and professional students may have symptoms of depression, stress, and substance abuse (Stecker, 2004).

Physical Activity and Cardiovascular Diseases

Updated PA guidelines recommend that all adults should engage in at least 150 minutes a week (30 minutes, 5 days a week) of moderate intensity or a minimum of 75 minutes a week (25 minutes, 3 days a week) of vigorous intensity aerobic PA for substantial health benefits. The amount of PA should be increased significantly to obtain more extensive health benefits (US Department of Health and Human Services, (USDHHS), 2008). Numerous physical and mental benefits of exercise have been well documented throughout the medical and sociological literature. The benefits of exercise and activities include reduced risk of diabetes, heart disease, high blood pressure, bone

loss, premature death, improvements in weight management, and increased overall fitness level (Warburton, Nicol, & Bredin, 2006). In terms of CVD prevention, it is reported that there is a 20%-35% relative risk reduction in all causes of mortality including CVD among men and women (Warburton et al., 2006). The evidence also suggests that the benefits of exercise extend beyond the primary prevention of chronic physical illnesses and include improved mental well-being and enhanced quality of life (Rhodes, Plotnikoff, & Courneya, 2008). Insufficient PA has been recently reported as an emerging public health concern among adults and children in the United States and globally (World Health Organization (WHO), 2009).

The major findings from two landmark studies rendered the basis for the PA recommendations by USDHHS in 2008. First, in the health professionals' follow-up study (Tanasescu et al., 2002), total PA, running, weight training, and rowing were inversely associated with risk of CHD. Researchers followed 44,452 male health care professionals between the ages of 40 to 75 years for 12 years. Additionally, PA was associated with lower body mass index, lower intakes of total fat and saturated fat, higher fiber intake, low consumption of alcohol, and lower prevalence of smoking, and hypertension. Men who ran for an hour or more per week had a 42% reduction in the risk of CHD compared with men who did not. Similarly, men who trained with weights for 30 minutes or more per week had a 23% risk reduction compared with men who did not train with weights. Rowing for one hour or more per week was associated with an 18% reduction in CHD risk. Average exercise intensity was associated with reduced CHD risk independent of the total volume of PA. Finally, a half-hour per day or more of brisk

walking was correlated with an 18% CHD risk reduction. The study was limited to only middle aged males.

Second, the National Institutes of Health- AARP Diet and Health Study followed 253,000 women and men aged 50 to 71 years for an average of five years. Moderate intensity PA for more than three hours per week predicted a 27% reduction in CVD mortality risk when compared with no PA (Leitzmann et al., 2007). Likewise, engaging in vigorous exercise for 20 minutes for three times or more in a week predicted a 32% reduction in CVD mortality risk. Those engaged in some PA at less than recommended level showed modest but significant reduction in mortality from any cause, CVD, and cancer. Further studies have suggested that vigorous intensity PA is more beneficial than moderate PA for CVD risk reduction (Swain & Franklin, 2006). Vigorous intensity PA are those in which heart rate increases, breathing becomes heavier, and conversation is harder (O'Donovan et al., 2010).

Student Populations and Physical Inactivity

American universities appear to have an environment that is conducive to PA. But, the reports from national surveys and reviews have revealed some conflicting findings. More than 50% of college students are noted to be insufficiently active in the United States (Irwin, 2007). Yet, in the recent years, the student population or young adult population general has not been the population of interest for researchers that are conducting studies in CVD. Few studies have investigated risk factors for CVD among university students' especially undergraduate students. No studies have reported the prevalence of CVD among these populations. Thus, there are very few published reports that examine risk factors, prevalence, and utilization of CVD prevention strategies among

graduate students. Some of the relevant publications and landmark studies are discussed below.

Makrides, Veinot, Richard, McKee, and Gallivan (1998) carried out a needs assessment of university students living in residences in Canada. Over 50% of their study participants reported engaging in exercise fewer than 3 times a week. Lack of time was most commonly reported as the barrier to PA by 77% of the students; this was followed by lack of motivation or will power (53%). Eighty-two percent of the students reported eating fewer than or equal to three servings of fruits and vegetables, 15% identified themselves as smokers, and 56% reported their current stress level as high or very high. Among students, 64% reported walking frequently. Significant correlations were found between students perceived level of CVD knowledge and students' level of PA ($p < 0.001$) and between students' perceived knowledge of nutrition and the consumption of fruits and vegetables ($p<0.001$). Such associations between students' health related knowledge and actual health practices signify the importance of knowledge in disease prevention. In the study, no difference was found in PA based on gender but females ate greater servings of fruits and vegetables than their male counterparts.

Despite those findings by Makrides et al. (1998), there is often a discrepancy between what people know and what people do as dictated by many life related factors. An example is the previously cited study by Frost (1992), in which 72% of the students identified exercise as a key element of CVD prevention but on 33.5% reported that they exercised regularly. Mazloomi, Hassan, and Ehrampoosh, (2005) in Iran also assessed the level of exercise among health sciences students ($n= 160$) and their reasons for not exercising. Forty-two percent (26% para-medical students, 31.4% dentistry students, and

35% students from other health sciences) reported that they did not participate in exercise at all. The major reasons provided were lack of time and disinterestedness. A significantly greater significant percentage of the students in PhD programs (74%) were knowledgeable about the benefits of exercise compared to 19% of those in associate degree programs ($p = 0.005$).

Irwin (2007) conducted a longitudinal study in Southern Ontario that assessed students' PA maintenance at the level necessary for substantial health benefits over one month. The participants were 392 undergraduate students recruited from two university campuses, 147 males and 238 females with a mean age of 23 years. Of the 199 students (51%) placed under active student category at baseline, only 82 students remained under this category at the end of one month. Only 35% of participants' maintained their PA for one month at the level necessary to gain health benefits. Utilizing "PA Guidelines for Health, PAGH" as a standard to measure PA, PA maintainers were more likely to be enrolled in a health-related academic discipline and be in their fourth year of study than were the insufficiently active subjects ($p < .05$). The investigation was limited by very low response rate and inclusion of students from only two universities, raising the concerns about generalizability of the results beyond the study participants.

An international survey conducted among 19,298 university students aged 17 to 30 years from 23 countries (Haase, Steptoe, Sallis, and Wardle, 2004) discovered that the majority of the students engaged in less than recommended levels of PA. The researchers also evaluated the students' attitudes about benefits of PA and knowledge about the role of PA in preventing chronic disease. The analyses were based on data collected for the International Health and Behavior Survey (IHBS), a large scale cross-

sectional international study. Two items were used to measure leisure-time PA: 1) whether the individual had engaged in any exercise (sport, physically active pastime) in the past 14 days, 2) number of PA episodes over that period. Leisure-time PA at recommended levels was more common in men (28%) than women (19%). The prevalence of physical inactivity varied remarkably across countries, ranging from 11% in Belgium to 41% in Portugal and South Africa among men and 15% in the US to 65% in Portugal among women. However, 48% of the men and 52% of the women from the US in the study were knowledgeable about the influence of PA on prevalence of CVDs. PA among populations was shown to be dependent on the demographics of the population (age, gender, marital status, and parenting status).

Sabourin and Irwin (2008) compared PA behavior among parent and non parent graduate and undergraduate students using an adapted version of the Godin Leisure Time Exercise Questionnaire. Out of 182 parents, only 16% (n=3) parents and 49.5% (n=90) of non-parents met the CDC-ACSM guidelines for moderate PA. When the parent and non parent groups were combined, out of 245 students, 31% of men (n=9) and 49% of women (n=84) women met CDC-ACSM guidelines for moderate PA. Physical inactivity was prevalent among all students but 84% of parents did not meet CDC-ACSM guidelines for moderate PA. Graduate students composed only 11% of the sample, yet it was representative of health sciences (18%), social sciences (40%), arts (10%), law (2.9%), media/information technology (4%), and general sciences (25.4%). They concluded that a significant proportion of the students who are parents may be at increased risk for the negative health consequences associated with an inactive lifestyle.

A meta-analysis of studies on college students' PA behaviors by Keating, Guan, Piñero, and Bridges reported that 30 to 50% of the college students are physically inactive (2005). This range of physical inactivity was similar to what has been reported of general population (40%). The authors analyzed previously published studies into two groups: 1) description of the students' PA pattern, stages of PA behavior changes, and determinants of PA behaviors, 2) intervention programs for promoting PA among students. The authors noted that none of the studies addressed the graduate student populations in higher education. The analysis identified four general factors that determine college students' PA: (1) personal, (2) social, (3) cognitive, and (4) environmental factors. Specific factors associated with PA behaviors were age, gender, ethnicity, perceived enjoyment of PA, and history of PA in the past. Furthermore, minority students participated in less PA when compared to Caucasians, social support was more important for female than male students for participation in PA, and students were more active during weekdays than during weekends, a pattern differing than that in the general population. This unique pattern of PA calls for unique strategies tailored to encourage PA among the student population. The authors pointed out three problems with current research in PA among student population; college students' PA has been seriously neglected as a research topic, 2) there is a lack of multiple-level approaches to promote PA among these populations, and , 3) measures of PA are subjective and inconsistent, making comparisons of PA patterns difficult across studies. Finally, as numerous studies indicate, health and PA professionals in higher education have not been able to effectively increase students' PA behaviors in academic settings.

Motivating and Demotivating Factors for Exercise and PA

The Merriam-Webster Collegiate Dictionary (2003) defines motivation in two ways; 1) the act or process of motivating, the condition of being motivated 2) a motivating force, stimulus, influence, incentive, or a drive. A more comprehensive definition of motivation may be the interaction of cognitive, affective, behavioral, and social processes contributing to purposeful, often goal directed behavior (DiNardo, 2005). It is clear that motivation is not a single entity or trait but rather a dynamic model made up of many different elements. Motivation, as it pertains to exercise, is often grouped into two categories; extrinsic and intrinsic motivation. Intrinsic motivation comes internally from within an individual and compels one to do something desirable. But, extrinsic motivation occurs when external factors compel the person to do something; examples are encouragement and social support from peer, family, or a healthcare provider (Deci & Ryan, 1991). Both the extrinsic and intrinsic factors involved with exercise may be personal, social, or environmental. Specific intrinsic factors that motivate an individual to become physically active may be his/her personal health status, personal beliefs about exercise, knowledge of disease prevention, perception of susceptibility, personal competence, self-determination, and personal stress and energy level. Similarly, the examples of specific extrinsic factors that either motivate or de-motivate an individual to exercise are physical environment, availability of the resources, and social support. In general, intrinsic motivators produce long term adherence to PA among individuals (Deci & Ryan, 1991).

Early motivational theorists describe the deterministic aspects of motivating factors for behaviors; instinctual drives (Freud, 1962), physiological drives (Hull, 1951, 1943), and environmental influences (Skinner, 1995). White (1959) argued that people

are driven by a need to be effective in mastering the aspects of their environment. White proposes that when people are successful in mastering the challenges of their environment, they will have a feeling of efficacy. This feeling of efficacy in turn, serves as intrinsic motivation that encourages continuation of behavior in the same direction. Cognitive evaluation theory of intrinsic motivation further justifies that intrinsic motivation is driven by the individual's innate desire for competence and self-determination in mastering one's surrounding (Frederick & Ryan, 1995). The rewards for the behavior motivated by this desire are feelings of competence, promotion of autonomy, and positive emotions such as enjoyment. The argument is that the reward collected will assist people to maintain or perhaps increase a given behavior.

Motivational theories are in agreement with the fact that health related behaviors are motivational constructs. These motivational constructs vary among individual to individual based on personal, social and demographic characteristics. Buckworth and Dishman (1999) have described five universal categories of variables that both serve as motivating or de-motivating factors for PA and exercise across populations: cognitive, demographic, behavior, social and physical environment. The authors believe that knowledge, attitudes, and beliefs about CVD and benefits of PA are types of cognitive factors that could be strong personal motivators. Similarly, the individuals are said to be intrinsically motivated when they engage in an activity for the inherent satisfaction that they derive from such activity (e.g., "I exercise because it is fun"). Likewise, they are said to be extrinsically motivated when they engage in an activity for outcomes that they attain through the activity (e.g., "I exercise because I enjoy meeting people while I exercise").

In regard to CVD prevention practice, positive or negative motivation to engage in exercise could be either intrinsic, extrinsic or both. Positive motivators for the most part lead an individual toward observation of healthy behaviors (Fluery, 1996). Some examples of such intrinsic motivators are the individual's spiritual or religious beliefs (Davis, 1998; Newlin, Knafl, & Melkus, 2002), perceived susceptibility to illnesses, and existing knowledge about the disease and prevention practices (Plowden & Miller, 2000). All of these factors could be powerful personal motivators which compel individuals to engage in healthy behavior such as good eating, exercising, sleeping, and utilizing stress reduction strategies (Fleury, 1996; Keller, 1993). Extrinsic or environmental motivators in terms of prevention of CVD are the factors external to an individual and related to the availability of resources, family, and social support (Nies, Vollman, & Cook, 1999). Nonetheless, the growing body of evidence supports the notion that expectations of both positive (e.g., motivation or benefits) and negative (e.g., demotivation or barriers) behavioral outcomes are associated with PA among adults. Expectation of positive outcomes or perceived benefits of PA has been consistently and positively associated with PA among adults (Ali & Twibell 1995) and adherence to PA (Robertson & Keller 1992) and vice versa. Similarly, social support from family and friends has also consistently and positively related to adult PA (Felton & Parsons 1994) and adherence to PA. Moreover, socialization is another example of motivation for exercise (Daskapan, Tuzun, & Eker, 2006).

In 2006, Daskpan et al. explored the barriers to PA as perceived by 303 Turkish university students, 222 females and 81 males, with a mean age of 20.5 years. The researchers assessed undergraduate students' current exercise habits and perceived

barriers to PA. Participants were asked to complete a self administered 12 item Likert scale questionnaire to determine perceived barriers to PA, categorized into internal and external barriers. Internal barriers were further grouped into three categories: 1) lack of energy, 2) lack of motivation, and 3) lack of self-efficacy. External barriers were also categorized into three groups: 1) lack of resources, 2) lack of social support, and 3) lack of time. Students perceived lack of time as most important internal barrier and lack of energy as the most important internal barrier. Other important barriers that emerged in the study were increased priority in academic success and increased responsibilities related to family and social environment. The study was limited to participants from only one private university and non inclusion of graduate students.

In a descriptive correlational study of 147 undergraduate students, 82% male and 18% female with a mean age of 19.9 years, Grubbs and Carter (2002) examined perceived benefits and perceived barriers to PA. The majority of the students perceived benefits of the exercise as those related to physical performance and appearance. Participants strongly agreed with the statement: "exercise increases my level of physical fitness." Similarly, the second most agreed upon statement was "exercise improves the way my body looks" and "my muscle tone is improved with exercise." The most substantial barriers to regular exercise expressed by the students were physical and social in nature. The barrier statements most students agreed with were: "exercise tires me," "exercise is hard work for me," "I am fatigued by exercise," "exercise takes too much of my time," and "family members do not encourage me to exercise". The mean score of the exercise benefits scale was 3.28 (SD= 0.38) for exercisers compared to 2.94 (SD= 0.36) for non exercisers ($p < .001$). The mean score for the barriers scale also was significantly

higher for exercisers (83.18 [SD= 0.38]) than for non exercisers (2.80 [SD= 0.32]) ($p<.001$). The findings have indicated that the students who exercised regularly, perceived significantly higher level of benefits than those who did not exercise. Higher percentages (92%) of males than females (63%) were exercisers. The study was limited to only undergraduate students.

A three phase study to develop a scale to measure PA benefits and barriers was conducted by Brown, Huber, and Bergman (2006). Three different groups of undergraduate students aged 18 to 24 years were the samples. During the first phase, exploratory interviews were conducted followed by administration of newly developed *Physical Activity Benefits and Barriers Scales (PABBS)*. The second phase also measured students' self reported PA. During the third phase, a finalized version of newly developed PABBS was administered to a group of students during a one week interval. The PABBS explored students' perceived PA benefits and barriers in addition to those noted in the prior studies. The PABBS has 26 potential benefits and 24 potential barriers measured on a 6-point Likert scale. Analysis of 50 items yielded 10 factors: low motivation, psychological improvement, social benefits, physical appearance, lack of peer interest, inconvenience, feel productive, time constraints, identity improvement, and unfamiliar with equipment. A 9-factor solution explained 59.79% of the variance. Nine of the 10 factors were significantly correlated with strenuous PA across both sexes ($p <.01$). Students were motivated to engage in PA by benefits related to psychological, physical performance, pleasure oriented, social, and image maintenance and de-motivated by lack of social support, time constraints, low motivation/fatigue, environmental/facility obstacles, and self-consciousness during PA. The findings alerted the experts in the field

to the critical role of motivation for PA. Like others, the study was limited by the use of female, young Caucasian, undergraduate students. Other researchers also explored the relationship between motivation to exercise and PA in other populations. Frederick and Ryan (1995) distinguished between enjoyment, competence, and body-related motivations for exercise and PA. They compared PA among individuals with sport as a primary aim for doing exercise to individuals who have behavior regulation as the primary aim of PA. The people with sport participation as primary reason for exercising had higher levels of enjoyment and competence-related motives, whereas those with fitness as the reason for exercising had higher levels of body-related motive. In a longitudinal study, Ryan, Frederick, Lepes, Rubio, & Sheldon, (1997) found that high adherers and low adherers to exercise differed significantly according to the amount of baseline enjoyment, competence, and social factors present as motivations. No difference was noted based on participants' level of motivations related to fitness or weight management.

Motivation and demotivation related to exercise and PA were studied qualitatively by Greaney et al. (2009) via 16 on-line focus groups discussions among 115 students with a mean age of 19.7 from eight universities. The participating students acknowledged intrapersonal, interpersonal, and environmental factors as enablers as well as barriers to weight management activities such as eating well, walking, and exercising. Intrapersonal factors were not engaging in exercise, not eating healthy food, and temptation and lack of discipline, and being bored. Similarly, Interpersonal factors included social situations (e.g., going out for dinner, social drinking). Environmental factors identified were time constraints associated with being a student, unhealthful food served at university

cafeterias, universal availability of unhealthful food, and lack of access to healthful food. These factors appear to be ones that are relevant for university students in terms of maintaining a healthy lifestyle.

This section presented the findings of key studies conducted for the purpose of determining the motivation and demotivation in the form of perceived benefits and barriers to exercise and PA. The studies were conducted with different aims and used diverse measurement instruments but reported perceived benefits and barriers to exercise and PA separately and/or in combination. The most frequently reported benefits of the exercise improvements in psychological health, physical performance, social benefits, image maintenance, physical appearance, and self identity. Commonly reported barriers to exercise were lack of energy, social support, self-efficacy, and time along with additional responsibilities and change in priority to academic success. Intrapersonal, interpersonal, and environmental factors, called enablers and barriers, were also seen as both motivators and de-motivators for adhering to weight management programs. These studies were limited with the use of undergraduate students only.

Exercise Related Self-efficacy

Self-efficacy is defined as "people's judgments of their capabilities to organize and execute courses of action required for attaining designated performances" (Bandura, 1986, p. 391). Exercise related self-efficacy is defined as a person's confidence about his/her ability to do specific PA or exercise under specific circumstances (D'Alonzo, Stevenson, & Davis, 2004). In a 3-part study, Rodgers et al. (2008) examined three behavioral domains of self-efficacy: task, scheduling, and coping. Task-efficacy was an individual's confidence in performing elemental aspects of exercise, coping self-efficacy

the individual's confidence in exercising under challenging situations, and scheduling self-efficacy the individual's confidence in exercising regularly in spite of other time demands (Rodgers et al, 2008).

The role of self-efficacy in initiation and maintenance of exercise and PA has long been a part of medical, sociological, and epidemiological literature, Self-efficacy has been found to be the most important determinant of the aspects of the frequency, intensity, and duration of PA (Coureya & McAuley, 1994). Evidence suggests that perceived self-efficacy for exercise has significant impact on individual's affect, thought, motivation, and actions. Self-efficacy's ability to predict exercise behavior have been tested among young adults with diabetes (Jonhston-Brooks, Lewis, & Garg, 2002), young adults without illnesses (Marquez & McAuley, 2006; Anderson, Wojcik, Winett, & Williams, 2006), older adults with or without illnesses (Hays & Clark, 1999; Resnick et al., 2000), and people with other health conditions (Jonhston-Brooks, Lewis, & Garg, 2002). The limited studies of exercise related self-efficacy in graduate students consistently found self-efficacy to be a significant mediator of PA. McAuley et al., (2007), reported that older adults with higher level of self-efficacy following a 6-month exercise intervention program were more likely to report higher levels of PA. Similarly, among young adults, increased levels of self-efficacy and positive effects were predictive of higher levels of PA. These findings strongly indicate that self-efficacy plays a positive role not only in initiation but also in maintenance of the behavior.

Garcia and King (1991), in a longitudinal study, found that self-efficacy to overcome barriers was a strong predictor of short term (6 months) and long term (12 months) exercise adherence ($r= 0.37$, $n=60$, $p<.01$). A study of sedentary individuals also

found that the level of self-efficacy was a key determinant for PA four months after termination of a structured exercise program (McAuley, 1992). Similarly, another study by McAuley (1993), found self-efficacy to be the only independent variable that could significantly predict participants' adherence to exercise during a 9-month follow up.

In a quasi experimental study (D'Alonzo, Stevenson, & Davis, 2004), 44 minority female, undergraduate college students participated in a 16-week planned exercise program aimed at increasing exercise self-efficacy through planned PA sessions. The hypothesis was that participating women experiencing more exercise benefits of exercise will have increased level of exercise self-efficacy and continue to exercise post intervention. Statistically significant differences were found in exercise self-efficacy and perceived benefits and barriers scores immediate post intervention and eight weeks post intervention. Participants with higher levels of exercise attendance perceived more benefits and had higher levels of exercise related self-efficacy. Conversely, the participants who attended PA sessions intermittently perceived higher levels of barriers and had lower exercise self-efficacy.

Lapier, Cleary, and Kidd (2009) also related exercise self-efficacy to participation in exercise programs among 50 patients with a mean age of 65 with coronary heart disease. The "*Self-Efficacy for Exercise Behavior Scale, SEEBS*" developed by Sallis, Pinski, Grossman, Patterson, and Nader (1988) was used. Higher scores indicated higher self-efficacy, with those less than 70% indicating lower self-efficacy. The mean score on the SEEBS was less than 70%, indicating low self-efficacy and increased risk for dropping out of exercise programs. This study supported a relationship between exercise self-efficacy and participation in exercise programs across the lifespan.

Summary of the Literature Review

The burden of CVD is growing with the global increase in the prevalence of physical inactivity. There is ample evidence that most of the modifiable risk factors for CVD-dyslipidemia, excess weight, diabetes, smoking, inactivity, and increased levels of stress may be minimized to some extent by recommended levels of exercise and PA alone. This exhaustive review of literature revealed that graduate students have been studied for their mental wellbeing in the face of their current stress level. Despite findings concerning an increased level of stress among graduate students and prevalence of CVD risk factors, no study has ever attempted to examine their knowledge about CVD and how that relates to their CVD prevention practice. This dissertation focuses on an examination of the PA behavior of graduate students, not just the risk factors for CVD. Increased PA alone has been found to be associated with reducing CVD risk factors such as obesity, diabetes, hypertension, and dyslipidemia and has also been linked to a reduction in smoking behavior and reduced stress level.

Theoretical Framework

Theory is a "conceptualization of the phenomenon of interest" (Kazdin, 2003, p. 124). Theory serves as a framework and guides the interpretation of relationships among the study variables. Kazdin states that the goal of research is to "understand" a process and that theory provides the underpinnings necessary to bring together "multiple variables and processes" (Kazdin, 2003, p. 129). Albert Bandura's *Social Cognitive Theory* along with Nola Pender's *Health Promotion Model,* provided the organizing framework for this study. These two well established theories are well suited for explaining motivating and de-motivating factors as they are linked to individual's perception of self-efficacy. Also, self-efficacy is highly associated with health promoting

behavior such as exercise and PA (Sallis et al., 1986). Bandura (1977) maintains that individuals with high level of self-efficacy or confidence in their ability to perform a given task will be more likely to engage in the task.

Health Promotion Model

The theoretical basis for the health promotion model (HPM) focuses on the multidimensional nature of individual's existence in which there are interpersonal and environmental circumstances and interactions that determine an individual's commitment to health and health promoting behavior. The HPM, originally developed in the early 1980s by Pender (Pender, 1996; Pender et al., 2005), has been regarded as a unique framework that serves as "a guide for exploration of the complex bio-psychosocial processes that motivate individuals to engage in healthy behaviors directed toward the enhancement of health" (Pender, 1996, p. 51). The multi-dimensional factors within the health promotion model explain motivating and de-motivating factors that may impact self-efficacy of an individual or group, enhancing the individual's ability to adequately engage in exercise and PA. Furthermore, the corresponding 43 question research tool (the exercise benefits and barriers scale) developed by Sechrist, Walker, and Pender (1987) is theoretically and psychometrically sound. After extensive examination of the wellness or health promotion literature, this model was decided to be one of the best theories in this area. Likewise, the exercise benefits and barriers scale (EBBS) is an instrument that is specifically designed to measure multi-dimensional components of health behavior. The following four themes of the *Health Promotion Model* guide explanation and also measurement of motivating and de-motivating factors for exercise and PA among graduate students.

1. Perceived motivations to execute a given behavior increase the likelihood of commitment to action and actual performance of the behavior.
2. Perceived barriers (de-motivating factors) can limit commitment to action.
3. Situational influences in the external environment can increase or decrease commitment to health promoting behavior.
4. Interpersonal influences such as families, peers, and health care providers have been shown to affect individuals' predisposition to engage in health promoting behaviors.

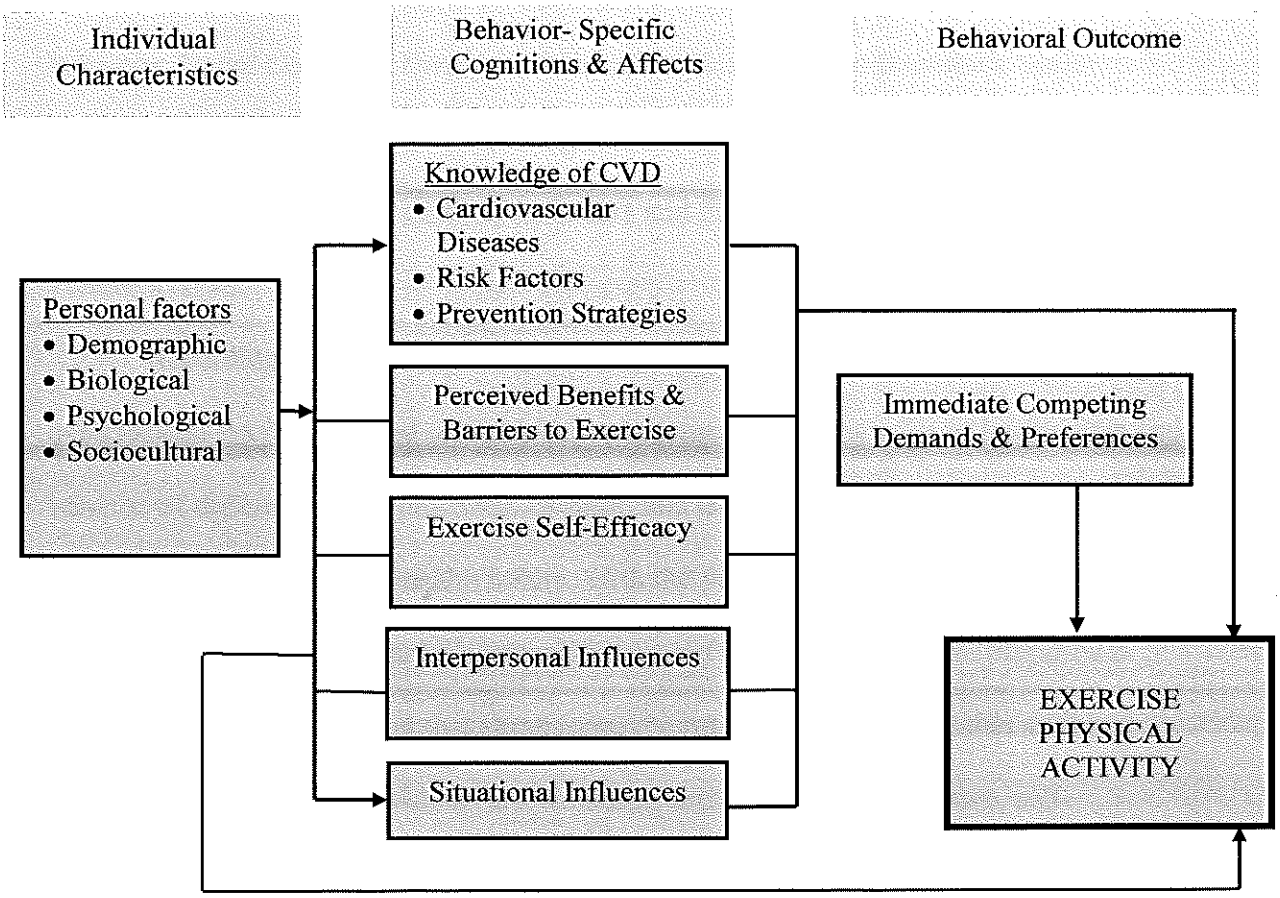

Figure 1. Schematic Representation of Pender's HPM.

Pender's HPM has been chosen because it explores the factors and relationships contributing to health promoting behavior. The model has been used to guide the

exploration of bio-psychosocial processes that influence one's decisions to engage in health behaviors and as a framework to predict health promoting lifestyles as well (McEwen & Wills, 2002). Additionally, the model integrates nursing and behavioral science with factors that influence people's ability to engage in and/or change health behaviors. Figure 1 describes Pender's HPM theory in a schematic representation.

Theory of Self-efficacy

While multi-dimensional factors surrounding an individual explain motivating and de-motivating factors that may impact self-efficacy leading to health related behavior, *Social Cognitive Theory* explains self-efficacy. Albert Bandura's Social Cognitive Theory (SCT) is utilized to explain the level of self-efficacy as it is either enhanced or diminished by motivating factors and de-motivating factors explained by Pender's HPM.

According to Bandura (2001), the core determinants of a given behavior such as exercise and PA is perceived self-efficacy as enhanced by knowledge of health risks and benefits of different health practices. In short, this is perceived self-efficacy that one can exercise control over one's health habits. With the publication of *Social Foundations of Thought and Action: A Social Cognitive Theory in 1986*, Albert Bandura proposed a theory of human functioning that emphasizes the role of self-beliefs. In this social cognitive perspective, individuals are viewed as self-organizing, proactive, self-reflecting, and self-regulating. Human thought and human action are viewed as the product of a dynamic interplay of personal, behavioral, and environmental influences that they have. The theory specifically proposes that a given behavior by an individual is significantly affected by three key factors: personal factors, environmental influences,

and behavior itself (Bandura, 1999). This dynamic interaction among three factors is termed as *triadic reciprocal determinism,* the central concept within the theory. Each of three factors operates as interacting determinant that influences each other bi-directionally. The major concept of the theory is perceived self-efficacy as the basis for health behavior.

Reciprocal Causation or Determinism

Reciprocal causation/determinism is the central concept of SCT, which argues that a person's behavior both influences and is influenced by personal factors and the social environment. Bandura accepts the possibility of an individual's behavior being conditioned by the consequences surrounding him/her. At the same time he asserts that a person's behavior and personal factors (cognitive skills or attitudes) can impact the environment.

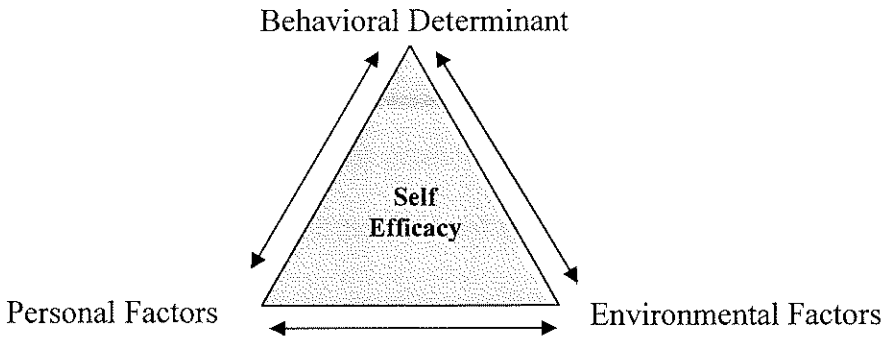

Figure 2. Reciprocal Determinism in Self-Efficacy.

Personal factors include cognitive, affective, and biological events within an individual. Environmental influences may be imposed, selected, or constructed. The individual does not have any control over the imposed environment influences but has the ability to understand the influence and react accordingly. The constructed environment involves creation of one's surroundings which requires the interactions between

environment, behavior, and personal factors. Within this relationship, external influences and internal change can alter behavior, which eventually may alter social structure. Reciprocally, social structure, such as economics, socioeconomic status and family dynamics, influences people indirectly by acting on internal self-regulatory factors (Bandura, 1999).

Self-efficacy

Self-efficacy is defined as "people's judgments of their capabilities to organize and execute courses of action required attaining designated types of performances" (p. 391). Self-efficacy is at the core of Social Cognitive Theory. The concept, "self-efficacy beliefs", provides the foundation for human motivation, well-being, and personal accomplishment. Perceived self-efficacy can have diverse effects on motivation, thought, affect, and action. Bandura's (1997) key contention as regards the role of self-efficacy beliefs in human functioning is that "people's level of motivation, affective states, and actions are based more on what they believe than on what is objectively true" (p. 2). For this reason, how people behave can often be predicted by the beliefs they hold about their capabilities than by what they are actually capable of accomplishing.

Exercise self-efficacy is a reliable predictor of PA behavior and has been described as a "critical variable for such behavior regardless of population." It is a personal belief that one has the ability to engage in PA and exercise to produce change through one's actions (Bandura, 2001). This ability of an individual depends on his/her own agentic behaviors (e.g., persistence), personal factors (e.g., beliefs), and the external environment (e.g., interactions with others). This network of behavior, personal factors, and external environment represents a reciprocal process in which the three factors are all

interacting with one another to explain motivation, de-motivation, and behavior itself. In order for an individual to succeed, the motivations (benefits) to engage in exercise behavior need to outweigh the de-motivations (barriers).

For graduate students, multiple roles with increasing demands and competing priorities may complicate this process of reciprocal determinism. For example, the goals related to career aspirations may have a negative impact on the goals to attend to physical needs such as exercise and PA. Goals always exist in a hierarchy, wherein proximal goals guide and motivate actions in the moment, and broader goals reflect personal values. Proximal goals are necessary to achieve broader goals, whereas broader goals construct proximal goals. According to Bandura (1999), mastery of proximal goals can result in self-satisfaction in and of themselves, thereby becoming a source of self-motivation.

Bandura (1999) also notes that self-efficacy belief is influenced by motivation to achieve a particular goal. Lower self-efficacy or lack of belief in one's capabilities will result in non-achievement of goals; whereas, increased self-efficacy will bring about more effort in order to achieve goals. Among graduate students with multiple roles, the hierarchy of goals may be multifaceted. Due to increasing demands and conflicting priorities, motivation to achieve a goal of engaging in regular PA may be mediated by any effects the effort, time, and resources utilized may have on the achievement of goals. Bandura (1977) believes that a person must value the outcomes or consequences that he or she believes will occur as a result of performing a specific action. Outcomes expectation of engaging in PA may be having immediate benefits (e.g., feeling energized) or long-term benefits (e.g., experiencing improvements in CV health). Furthermore, those with higher levels of self-efficacy tend to visualize success, whereas those with lower

levels tend to visualize failure, which can then impact motivation level (Bandura, 1999). Thus, Bandura's self-efficacy construct has given researchers a meaningful way to understand why some people do not participate in the recommended amount of exercise and PA.

Combining Theories Together Within the Study

The concept of reciprocal determinism is highly significant in regard to the graduate student population because of factors related to academics, career, family, social norms, and finances. The perception of environmental structure may influence choices, feelings of control, and the ultimate decision whether or not to become physically active. Students that are able to construct their own environment will perceive the more control; because create their choices, and probably balance multiple roles, academics and personal health more effectively. Pender's HPM argues that the individual's ability to engage in health promotion activity depends upon factors such as demographic characteristics and behavior specific cognition (CVD knowledge). These two factors along with Bandura's reciprocal determinism appear on the surface of the study framework (Figure 3) and are connected with the motivating and de-motivating factors by unidirectional arrows.

The next level in the structure is perceived self-efficacy, which is connected by a unidirectional arrow originating from the motivating/de-de-motivating factors. If a person perceives high level of motivation (exercise benefits), he/she then will perceive a higher level of self-efficacy. But, if a person perceives a higher level of demotivation (exercise barriers) then he/she will perceive a lower level of self-efficacy. In order for an individual to perceive a high level of self-efficacy, perceived motivations must outweigh the de-motivation. At the core/center of the theoretical structure is PA or exercise, the major

outcome variable in the study. The structure communicates the philosophy that if a person perceives a high level of self-efficacy, he/she will engage more in PA and exercise. Conversely, if a person does not perceive high level self-efficacy due to perception of a high level of de-motivating factors, then he/she will not engage in exercise and PA as desired.

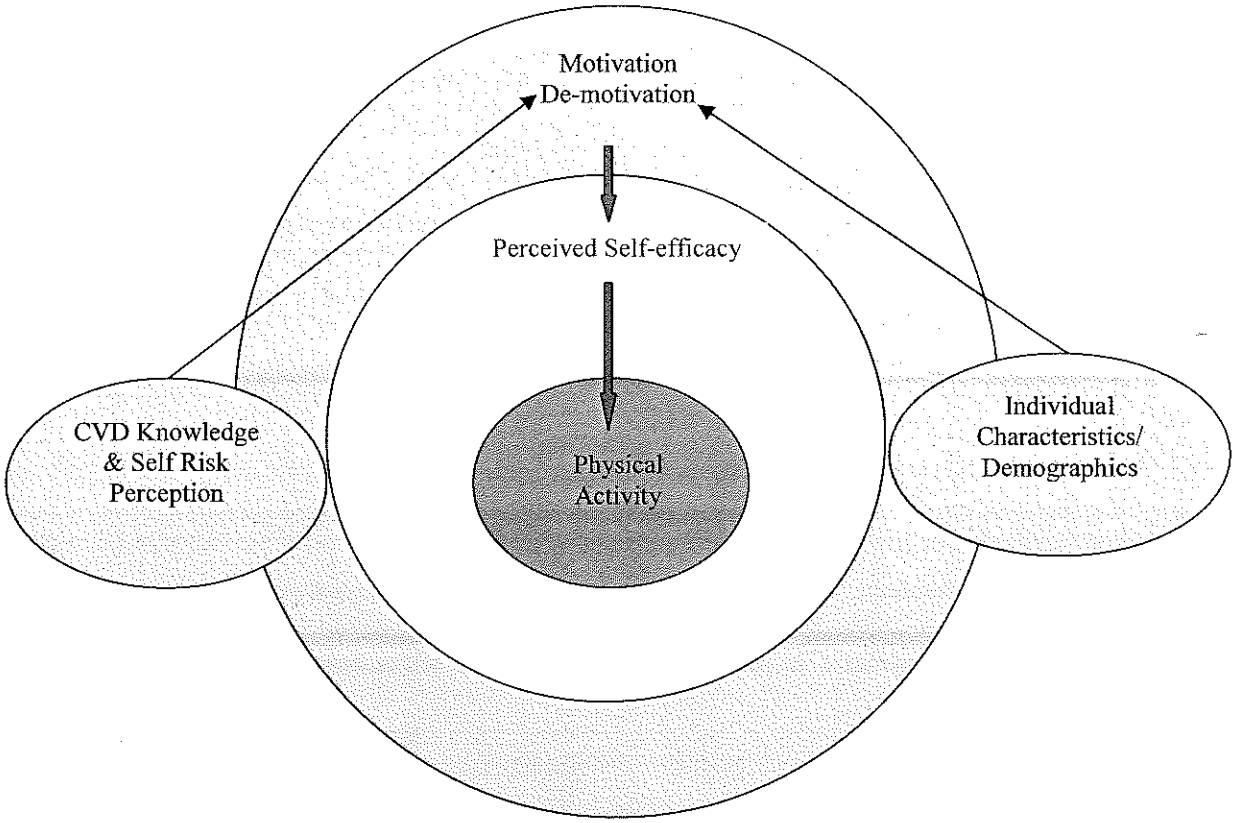

Figure 3. Schematic Representation of Theoretical Framework

CHAPTER III

METHODOLOGY

This chapter discusses the methodology of the study, including the design, setting, sampling, instruments, data analysis plan, and protection of human subjects.

Research Design

Using a descriptive/correlational design, a total of 9 research questions and related hypotheses regarding graduate students' knowledge and behaviors about CVD and its prevention were explored.

Sampling

Setting/Target Population

The target population consisted of 349 graduate degree level students enrolled in various academic programs at the University of North Dakota, a medium size research university in the upper Midwest.

Sampling Method

A purposive sampling technique was used to recruit full time graduate students enrolled in various academic programs. They were recruited through an email blast sent out by Office of Institutional Research of the University. An online version of the survey was distributed to all 1,122 full time graduate students. Inclusion/exclusion criteria were as follows:

1. Student enrolled in graduate degree programs.
2. Enrolled full time.

3. Able to read and understand English.

4. Willing to participate in the study.

The decision to recruit only full time graduate students was based on the fact that full time and part time students differ in regard to their time management, academic work load distribution, and financial responsibility.

Sample Size Determination

The sampling frame was the cohort of all full-time graduate students enrolled at the University of North Dakota in January 2011. An appropriate sample for the study was determined based on a commonly used approach called "N versus V" (number of observations vs. number of variables). This approach is generally used when the sample is not randomized and the study does not compare the group means. At least 10 subjects per independent variable is strongly suggested for multivariate analyses. Because 21 independent variables were identified, following this statistical rule of thumb, this study required a minimum sample size *(N)* of 210 (Knapp & Campbell-Heider, 1989; Munro & Page, 1993; Nunnally & Bernstein, 1994).

An internet based sample size calculator available of the web was also used to determine the sample size. With a sampling frame of 1,122, a confidence interval of .5, and confidence level of 95% were entered into the calculator; a sample size (N) of 286 subjects was indicated (research info.com, 2010). The goal was to obtain a large enough sample size to have a better chance of capturing statistically significant relationships at all levels of variables. Based on the above calculations, a sample size of at least 300 was set. Reminder emails were sent to the students after two and four weeks. The final sample size was 349 students.

Instrumentation

A customized survey packet consisting of six sections was developed. The six sections were; 1) cardiovascular disease knowledge, 2) personal health behavior information, 3) exercise and PA behavior, 4) perception of exercise self-efficacy, 5) perceived motivation and demotivation for exercise and PA, and (6) personal/demographic information section. Table 1 depicts the variables in the study, methods of measurement, tools used on measurement, and the levels of measurement for each variable.

Current knowledge about CVD was measured by a researcher-developed questionnaire based on a review of literature and consultation with experts in the field. Personal health behaviors related to smoking status, fruit and vegetable intake, alcohol consumption, and overall sleeping behavior were measured by items modeled after those used in the *Behavioral Risk Factor Surveillance System (BRFSS) survey.* Students' current level of PA was measured with the short form (18 items) of "*The International Physical Activity Questionnaires (IPAQ).* A 9-item 10-point Likert *Multidimensional Self-efficacy Scale (MSES)* measured three types of exercise related self-efficacy; task, coping, and scheduling (Rodgers et al. 2008). Perceived motivating and de-motivating factors for exercise and PA were examined using the "*Exercise Benefits and Barriers Scale*" (*EBBS),* a 42-item, 4-point Likert scale. The final section consisted of personal/demographic information, including age, gender, ethnicity, marital status, academic area of study, level of study, and employment status.

Table 1. The Study Variables, Tools, Methods and Levels of Measurement.

Variables	Measurement Method	Measurement Tool	Scale of Measurement
CVD Knowledge 1. CVD knowledge 2. Knowledge of CVD risk factors. 3. Knowledge of prevention practices	Researcher developed CVD knowledge questionnaire	The questionnaire will ask participants to choose 4 conditions that qualify to be CVD disease, 5 CVD risk factors, and 5 common preventive strategies. Each correct answer will be assigned 2 points. If participants select all correct answers, they will score highest score and vice versa.	Ratio scale measurement Higher numbers indicate that participants have higher knowledge on CVD. It does have a fixed zero point that means participants scoring 0 have no knowledge.
Exercise related self-efficacy 4. Task 5. Coping 6. Scheduling	Multidimensional Self-efficacy scale: Coping, Scheduling, Task Efficacy Scale	9 items. Measures the degree of confidence in ability to exercise regularly rated on 100 point scale for each item.	Interval scale
Motivating & De-motivating factors for exercise and physical activity. 7. Exercise benefits 8. Exercise barriers	Exercise Benefits /Barriers Scale (EBBS) (revised for graduate student population.	42 items, 4-point Likert scale: Strongly agree to strongly disagree	Ordinal scale. The total scores for instrument (Benefits/Barriers combined) range from 43 to 172. The higher the score, the more positively the individual perceives exercise benefits and vice versa. Barrier Scale items are reverse-scored.
Physical Activity and Exercise 9. VPA 10. MPA 11. Walking	The short-form of International Physical Activity Questionnaire (IPAQ)	9 items, Estimates the time spent performing physical activities (moderate to vigorous) and inactivity (time spent sitting).	Ordinal scale. Computation of the final score is done by summation of the duration (in minutes) and frequency (days) of walking, moderate-intensity and vigorous-intensity activities.

Table 1. Cont.

Personal Health Behavior 12. Smoking status 13. Alcohol behavior 14. Fruits & vegetable intake	Researcher developed health behavior questionnaire	Items from BRFSS Smoking (current, former, never-smoker) Alcohol intake (current drinker, regular, drinks per week). Fruits & vegetable (servings per day)	Smoking (nominal scale) Alcohol intake (nominal & ratio) Fruits & vegetable intake (ratio)
Personal Health Behavior 15. Sleeping behavior	Researcher developed health behavior questionnaire	A single item derived from BRFSS. The question asks the participants to choose a range of numbers in response to the following question. During the past 30 days, for about how many days have you felt you did not get enough rest or sleep?	Ratio Scale Measurement The respondents are required to provide the actual number of days that they did not get enough or felt did not get enough sleep and rest.
Demographic factors 16. Age 17. Gender 18. BMI 19. Marital status 20. Employment status 21. Ethnicity 22. Educational level 23. Academic area	Researcher developed demographic questionnaire	Demographic questionnaire	Age group (Ordinal scale) Gender (Nominal scale) Marital status (Nominal scale) Employment status (Nominal scale) Race (Nominal scale) Educational level (Nominal scale) Academic area (Nominal scale) Income level (Ordinal scale)

Measures of Cardiovascular Disease Knowledge

As noted above, cardiovascular disease knowledge was assessed using a researcher-developed questionnaire which consisted of four multiple-choice questions. The first three addressed CVD knowledge; the fourth concerned the students' perception of their risk for CVD. Participants were given choices in regard to various types of CVD, general CVD risk factors, and general CVD prevention strategies. The choices were based on the elements of CVD, risk factors, and prevention strategies such as exercise and PA, weight management, nutrition, blood pressure control, smoking cessation, diabetes control, and cholesterol management. Participants were required to select at least four common CVD conditions, five common CVD risk factors, and five commonly utilized CVD prevention strategies. Two points were assigned for each correct answer selected and 0 for each wrong answer. Points for each area of CVD knowledge were summed to obtain final CVD knowledge scores: 0- 8 for knowledge about CVD, 0-10 for knowledge of CVD risk factors, and 0-10 for knowledge of CVD prevention practices. Finally, an aggregate CVD score combined the scores for CVD, CVD risk factors, and CVD prevention practices. A total CVD knowledge score was obtained by summing across the categories, and mean scores were calculated. For the measure of perception of risk for CVD, participants were asked to select high risk, moderate risk, or low risk.

The CVD knowledge questionnaire was piloted in a sample of 50 graduate degree students, and necessary modifications were made. Content validity of the questionnaire

was also tested via the expert opinions of a cardiologist, PhD prepared nurses, and a statistician.

Measures of Personal Health Behavior

CVDs as the leading causes of death and disability are directly associated with behavioral risk factors such as tobacco use, poor diet, inadequate sleep, inadequate PA, and excessive alcohol consumption. Items to elicit participants' responses regarding the prevalence of behavioral risk factors were modeled after the *Behavioral Risk Factor Surveillance System Survey (BRFSS).* Specific questions were asked about participants' smoking behavior, alcohol consumption behavior, and sleeping difficulties. A single item was added to determine daily consumption of fruits and vegetable.

Smoking Behavior

Smoking is one of the six major risk factors for CVD. Smoking is known to be the most important risk factor for young men and women under the age 50 (AHA, 2010). In this study, two aspects of smoking behavior were measured. A single indicator variable for smoking behavior was created for this study. Smoking status was coded 1 (current smoker), 2 (never smoker), and 3 (ex-smoker).

Alcohol Consumption Behavior

Students were first asked if they consumed alcoholic beverages. If the students answered yes, then they were asked to respond with the number of drink/s per day/week/month. The actual number of drinks was the measure. According to the BRFSS, one drink is equivalent to a 12-ounce beer, a 5-ounce glass of wine, or a drink with one shot of liquor. The participants' responses were also coded 1 for current drinker and 2 for non drinker.

Sleeping Behavior

Sleep deprivation is exceedingly common in today's society; data suggest progressive reductions in sleep duration for North Americans. Although the neurocognitive consequences of sleep deprivation are well established (Van Dongen, Maislin, & Mullington, & Dinges, 2003), emerging data suggest major metabolic (Spiegel,Tasali, Penev, & Van Cauter, 2004; Patel, Malhotra, White, Gottlieb, & Hu, 2006; Flier & Elmquist, 2004) and CV consequences to chronic partial sleep restriction (Ayas et al., 2003). Graduate students often complain about poor sleep due to stressful academic environment and the uncertainty of their success in obtaining their degree (Pallos, Amada, Doi, & Okawa, 2004; Forquer, Camden, Gabriau, & Johnson, 2008). Overall sleeping behavior was measured using a single item question derived from the BRFSS. The participants were asked if, during the past 30 days, they felt that they did not have enough rest or sleep; this was coded 1 (yes) or 2 (no). If they answered yes, they were asked for about how many days they had felt that they did not get enough rest or sleep. The responses were coded as 1(1-2 days), 2 (3-4 days), 3(5-6 days), and 4 (7 days or more). They could skip the question if they did not feel they were having any sleep problems.

Consumption of Fruits and Vegetables

Prospective cohort studies have suggested an association between increased fruit and vegetable consumption and a reduced risk of CVD (Dauchet, Amouyel, Hercberg, & Dallongeville, 2006; He, Nowson, MacGregor, 2006). This evidence has led to specific recommendation for increased fruit and vegetable consumption from the American Heart Association (Appel et al., 2006). A single item measured daily consumption of fruits and

vegetables by students: "How many servings of fruits and vegetables do you eat on a daily basis?" The responses were coded as 1(0-1 servings), 2(2-3 servings), 3(4-5 servings), 4(6-7 servings), and 5 (8 servings or more).

Measures of Physical Activity and Exercise

PA and exercise levels were measured with the short form (7items) "*International Physical Activity Questionnaire (IPAQ).* The IPAQ was developed in 2002 in order to provide a standard instrument that could be used to obtain comparable estimates of PA participation from surveillance system data nationally and internationally. The instrument has been translated into at least 14 languages and modified to accommodate culturally appropriate definitions of vigorous and moderate PA. The IPAQ shorter version was used because the study's purpose was to estimate participants' level of PA without going deeper into the five domains addressed by the 27-item longer version. The shorter version summarizes the five domains, and both versions have been shown to yield similar results in term of PA measurement (Craig et al., 2003). The short form IPAQ is a 7-item scale assessing the total minutes spent in vigorous PA (VPA), moderate intensity PA (MPA) and walking during the last 7 days (3 items). The days spent doing each level of PA are assessed (3 items). Metabolic Equivalents (METs)-minutes is calculated by multiplying the amount of minutes by 6 (vigorous), 4 (moderate), 3.3 (walking) (3 items). The IPAQ is scored according to the guidelines for three categories of levels of PA:

a. Category one. These participants do not meet the criteria for categories two or three. They are considered inactive.
b. Category two. These people are minimally active. Participants meet the following three criteria: three or more days of vigorous PA of at least 20 minutes per day; five

or more days of moderate intensity PA or walking of at least 30 minutes per day; or five or more days of any combination of walking, moderate-intensity or vigorous intensity PA achieving a minimum of at least 600 MET-min/week.

c. Category three. This category of activity level qualifies as health enhancing physical activity (HEPA). Individuals in this category engage in vigorous intensity PA on at least 3 days and accumulating at least 1500 MET-minutes/week or 7 or more days of any combination of walking, moderate intensity or vigorous intensity PA achieving a minimum of 3000 MET-minutes/week.

The IPAQ has acceptable measurement properties; at least as good as other established self-report instruments (IPAQ, 2005). A study of the reliability and validity of the IPAQ in 12 countries found it to yield repeatable data with Spearman's Rho clustered around 0.8. Criterion validity exhibited a median of about 0.30 to .60; this was comparable to most other self-report validation studies (Craig et al., 2003).

In this study, scores for the three subscales, walking, moderate PA, and vigorous PA were used to calculate the total IPAQ score. The standardized Cronbach's Alpha score for these three items was 0.55. However, the IPAQ scores were not normally distributed so nonparametric Spearman correlation coefficients (ρ) were calculated as the primary measure of reliability. The total reliability coefficient correlations scores were .89 (p. = .000) for vigorous PA, .88 (p. = .000 for moderate PA, and .89 (p. = .000) for walking (Table 2). These numbers are consistent with those reported by Craig et al. (2003).

Measures of Exercise Related Self-Efficacy

Exercise related self-efficacy was measured by the *Multidimensional Self-Efficacy Scale (MSES.* Exercise self-efficacy is defined as participants' confidence in their ability to exercise or become physically active regularly (most days of the week) under various circumstances. The scale uses a 100% confidence scale ranging from 0% (no confidence) to 100% (absolute confidence). Following the stem ''How confident are you that you can'', three items measured task self-efficacy (e.g., ''complete the exercise using proper technique''), three items measured coping self-efficacy (e.g., ''exercise when you lack energy''), and a final three items measured scheduling self-efficacy (e.g., ''arrange your schedule to include regular exercise''). Responses for Likert items (9 items) on the MSES were entered as the actual values between 10 and 100. For final analysis, the mean scores for each of the three subscales, task, coping, and scheduling self-efficacy, were calculated.

Table 2. Reliability of International Physical Activity Questionnaire (IPAQ): Spearman's Correlation Coefficient Based on Total MET-Minute Per Week.

Correlations					
			MET-Min for VPA	MET-Min for MPA	MET-Min for walking
Spearman's rho	MET-Min for VPA	Coefficient	1.000	.349**	.079
		Sig. (2-tailed)	.000	.000	.141
		N	349	349	349
	MET-Min for MPA	Coefficient	.349**	1.000	.324**
		Sig. (2-tailed)	.000	.	.000
		N	349	349	349
	MET-Min for walking	Coefficient	.079	.324**	1.000
		Sig. (2-tailed)	.141	.000	.
		N	349	349	349

**. Correlation is significant at the 0.01 level (2-tailed).
VPA= vigorous physical activity, MPA= moderate physical activity

The MSES has been found to have sound psychometric properties. In a series of studies by Rodgers et al. (2008), self-efficacy was assessed using the same 9 items. Cronbach's alpha ranged from .76 to .95 across all three measurement scales, scheduling,

task, and coping, reflecting acceptable internal consistency. These three dimensions of self-efficacy have been validated together or in isolation in many other studies.

In this study, Cronbach alpha reliability estimates of the MSES were 0.91 for the entire scale (9 items), 0.93 for the task efficacy subscale (3 items), 0.87 for coping efficacy (3 items), and 0.93 for the scheduling efficacy sub scale (3 item). Principal component analysis estimated the internal structure of the MSES. Two factors explained 76.09% of the total variance; the first factor explained 60.8% (EV = 5.47) and the second factor 15.24% of the variance (EV = 1.37) (Table 3). The 2-factor solution using varimax rotation with the factor loading matrix resulted in all nine items of the MSES correlating at least 0.7 with at least one other item; this indicated reasonable factorability (Table 4). The Kaiser-Meyer-Olkin measure of sampling adequacy was .87, above the commonly recommended value of .6, and Bartlett's test of sphericity was significant (p= .000).

Table 3. Eigenvalues and the Proportion of the Total Variance for the Multidimensional Self-efficacy Scale (9 items): Principal Components Analysis with Varimax Rotation.

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Sq. Loadings			Rotation Sums of Sq. Loadings		
	Total	Variance %	Cum. %	Total	Variance %	Cum %	Total	% of Variance	Cum %
1	5.476	60.844	60.844	5.476	60.844	60.844	3.881	43.117	43.117
2	1.372	15.247	76.091	1.372	15.247	76.091	2.968	32.974	76.091
3	.920	10.217	86.308						
4	.365	4.060	90.368						
5	.216	2.399	92.767						
6	.200	2.219	94.986						
7	.179	1.986	96.972						
8	.140	1.555	98.527						
9	.133	1.473	100.000						

Extraction Method: Principal Component Analysis

Table 4. Factor Loadings and Communalities for the Multidimensional Self-efficacy Scale (9 items): Principal Components Analysis with Varimax Rotation.

Rotated Component Matrix		
Items on the scale	Component	
	1	2
How confident are you to exercise when you feel discomfort?	.729	.308
How confident are you to exercise when you lack energy?	.847	.195
How confident are you to exercise when you do not feel well?	.820	.060
How confident are you to complete your exercise using proper technique?	.289	.881
How confident are you to follow direction to complete exercise?	.229	.908
How confident are you to perform all the required movements?	.272	.900
How confident are you to include exercise in your daily routine?	.755	.421
How confident are you to consistently exercise 5 times a week?	.776	.349
How confident are you to arrange your schedule to include regular exercise?	.760	.349

Extraction Method: Principal Component Analysis, Rotation Method: Varimax with Kaiser Normalization.

Measures of Motivating and De-motivating Factors

Participants' perceptions of factors that motivate or de-motivate them towards engagement in exercise and PA, are measured with the *"Exercise Benefits and Barriers Scale (EBBS)"*. This instrument was initially developed by Sechrist et al., in 1987. Though the instrument uses the terms benefits and barriers to exercise, these two terms "benefits" and "barriers" of exercise and activities were seen to be equivalent to motivating and de-motivating factors for exercise and PA in this study.

The EBBS is a 43 item questionnaire with Likert items which have been found to have the following internal reliabilities: overall scale, .89; benefits scale, .89; barriers scale, .77. Twenty-nine items address perceived benefits and 14 items address perceived barriers to exercise. Previous research has yielded nine factors: life enhancement, physical performance, psychological outlook, exercise milieu, social interaction, time

expenditure, preventing health, physical exertion, and family encouragement (Schrist, Walker, & Pender, 1987). In this study, the 29 Likert items of the exercise benefits scale (motivating factors) were coded 1= strongly disagree, 2= disagree, 3= agree, and 4= strongly agree. The 14 items on the exercise barriers scale (de-motivating factors) were reverse coded 1= strongly agree, 2= agree, 3= disagree, and 4= strongly disagree. The total score is interpreted as greater exercise higher benefits and fewer barriers. For final analysis, the scores on exercise benefits and barriers scales were summed and mean scores were calculated for both exercise benefits and barriers (Sechrist et al., 1987).

The EBBS has been used to access perceived barriers and benefits of exercise among a wide range of adult populations and shown to carry sound psychometrics. In the current study, the Cronbach alpha reliability estimates for the EBBS were 0.93 for the entire scale, 0.94 for the exercise benefits subscale, and 0.83 for the exercise barriers subscale. Principal components analysis (PCA) estimated the internal structure of the EBBS; this method identifies the composite benefits and barriers scores underlying the EBBS. The first five components explained a cumulative variance of 62% (Table 5). The initial Eigenvalues (EV) showed that the first component explaining 41% of the variance (EV = 11.9) was the strongest. The explained variance for the remainder of the components ranged from 6.99% for the second component (EV = 2.03) to 4% for the fifth component (EV = 1.17). As shown in Table 6, a 5-factor final solution based on a varimax rotation of the factor loading matrix found that all 29 items in the exercise benefits sub scale correlated at least .5 with at least one other item; this suggested reasonable factorability. The Kaiser-Meyer-Olkin measure of sampling adequacy was

.94, above commonly recommended value of .6, and Bartlett's test of sphericity was significant.

Table 5. Eigenvalues and the Proportion of the Total Variance Explained Derived from Principal Components Analysis of the Exercise Benefits Scale (29 items).

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	11.928	41.132	41.132	11.928	41.132	41.132	6.496	22.400	22.400
2	2.030	6.999	48.131	2.030	6.999	48.131	3.866	13.330	35.730
3	1.482	5.109	53.240	1.482	5.109	53.240	2.948	10.167	45.896
4	1.361	4.695	57.935	1.361	4.695	57.935	2.761	9.520	55.416
5	1.176	4.055	61.990	1.176	4.055	61.990	1.906	6.574	61.990
6	.957	3.299	65.289						
7	.886	3.055	68.345						
8	.787	2.713	71.058						
9	.686	2.365	73.423						
10	.601	2.072	75.495						
11	.568	1.957	77.452						
12	.559	1.927	79.379						
13	.538	1.857	81.235						
14	.531	1.833	83.068						
15	.485	1.674	84.742						
16	.451	1.556	86.298						
17	.439	1.513	87.810						
18	.402	1.386	89.196						
19	.381	1.315	90.511						
20	.365	1.258	91.769						
21	.357	1.232	93.002						
22	.322	1.109	94.111						
23	.296	1.021	95.132						
24	.278	.958	96.090						
25	.255	.878	96.968						
26	.241	.831	97.799						
27	.237	.817	98.616						
28	.211	.726	99.342						
29	.191	.658	100.000						

Extraction Method: Principal Component Analysis.

PCA with varimax rotation was also conducted with the 14 items of the Exercise Barriers subscale. Four factors explained 61.6% of the variance (Table 7). The first component explained 31.81% of the variance (EV = 4.45), the second component explained 12.72% (EV = 1.78), and the third and fourth components explained 9.08% and

8.00% of the total variance, respectively (EVs = 1.27 and 1.12). The final 4-factor solution of varimax rotation of the factor loading matrix is depicted in Table 8. All 14 items in exercise barriers sub-scale correlated at least .6 with at least one other item, suggesting reasonable factorability. The Kaiser-Meyer-Olkin measure of sampling adequacy was .82, above the commonly recommended value of .6, and Bartlett's test of sphericity was significant.

Table 6. Factor Loadings and Communalities Based on a Principal Components Analysis with Varimax Rotation for the Exercise Benefits Subscale (29 items).

Rotated Component Matrix					
	Component				
	1	2	3	4	5
My muscle tone is improved with exercise.	.742	.187		.123	.143
Exercise improves the way my body looks.	.739		.157	.300	
My physical endurance is improved by exercising.	.738	.224	.286	.125	
Exercising improves functioning of my CV system.	.696	.197			.353
Exercise increases my muscle strength	.684	.313			.219
Exercise increases my stamina.	.646	.199	.315	.116	
Exercising increases my level of physical fitness.	.646	.358			.194
Exercising improves my self-concept.	.636	.233	.346	.146	
Exercise improves overall body functioning for me.	.591	.158	.334	.276	.113
I will live longer if I exercise	.572		.342	.134	.343
Exercise gives me a sense of personal accomplishment	.525	.357	.152	.157	.180
My disposition is improved with exercise.	.502	.367	.464	.163	
Exercise decreases feelings of stress and tension for me.	.307	.783	.144		
I enjoy exercise.	.144	.759		.285	
Exercise improves my mental health.	.383	.701	.170		.155
Exercising makes me feel relaxed.	.223	.578	.352	.286	.104
I have improved feelings of well being from exercise	.538	.543	.247		.157
Exercise improves my flexibility.	-.105		.632		
Exercising helps me sleep better at night.	.383	.259	.603	.166	
Exercising increases my mental alertness.	.420	.262	.601	.177	.169
Exercise improves the quality of my work.	.335	.298	.546	.400	
Exercise allows me to carry out normal activities without becoming tired.	.420	.119	.485	.405	.107
Exercise helps me decrease fatigue.	.246	.377	.438	.322	
Exercising is a good way for me to meet new people	.109	.224		.737	
Exercising increases my acceptance by others.	.189			.675	
Ex. lets me have contact with friends & persons I enjoy		.343		.615	.134
Exercise is good entertainment for me.	.155	.495	.129	.608	
Exercising will keep me from having high BP.	.182		.169	.130	.836
I will prevent heart attacks by exercising	.259	.129		.107	.802

Extraction Method: Principal Component Analysis, Rotation Method: Varimax with Kaiser Normalization.

Table 7. Eigenvalues and the Proportion of the Total Variance Explained: Principal Components Analysis of Exercise Barriers Scale (14 items).

Fac	Initial Eigenvalues			Ext. Sums of Sq. Loadings			Rotation Sums of Sq. loadings		
	Total	Variance%	Cum. %	Total	Varinace %	Cum. %	Total	Variance %	Cum. %
1	4.454	31.818	31.818	4.454	31.818	31.818	2.458	17.554	17.554
2	1.780	12.712	44.530	1.780	12.712	44.530	2.160	15.430	32.985
3	1.271	9.080	53.609	1.271	9.080	53.609	2.102	15.016	48.001
4	1.121	8.009	61.618	1.121	8.009	61.618	1.906	13.617	61.618
5	.850	6.072	67.690						
6	.719	5.138	72.828						
7	.694	4.960	77.789						
8	.606	4.330	82.118						
9	.543	3.882	86.000						
10	.494	3.527	89.527						
11	.461	3.289	92.816						
12	.388	2.772	95.589						
13	.344	2.454	98.043						
14	.274	1.957	100.00						

Extraction Method: Principal Component Analysis

Table 8. Factor Loadings and Communalities for the Exercise Barriers Subscale (14 items): Principal Components Analysis with Varimax Rotation.

Rotated Component Matrix				
	Component			
	1	2	3	4
Exercise facilities do not have convenient schedules for me	.745		.147	
There are too few places for me to exercise.	.712		.127	.190
Places for me to exercise are too far away.	.692		.218	.132
It costs too much to exercise.	.663	.103	.153	.158
Exercise tires me.		.847		
I am fatigued by exercise.		.835		
Exercise is hard work for me.	.122	.701	.127	.190
Exercise takes too much time from my family responsibilities.	.168		.831	.208
Exercise takes too much time from family relationships.	.194		.830	.213
Exercising takes too much of my time.	.309	.340	.624	
My spouse (or significant other) does not encourage exercising.			.282	.807
My family members do not encourage me to exercise.	.167		.334	.743
I think people in exercise clothes look funny	.266	.196		.511
I am too embarrassed to exercise.	.437	.264		.481

Extraction Method: PCA, Rotation Method: Varimax with Kaiser Normalization.

The 43-item Exercise Benefits and Barriers Scale (EBBS) demonstrated good psychometric properties and was well suited to the study of motivation (perceived

exercise benefits) and demotivation (perceived exercise barriers) for exercise and PA among graduate students.

Personal/Demographic Information

Information was collected about participants' age, gender, race, marital status, employment status, current educational level, academic area of study, and current household income. "Level of study", "gender", and "marital status" were dichotomous items. '"Level of study," was coded 0 =masters, 1 =doctorate", "gender as 0 = male, 1 = female and "marital status" as 1 = married and 0 = not married/single/divorced. Continuous variables such as age and BMI were calculated with actual numbers. "Ethnicity" and "study area" were nominal variables. "Ethnicity" was coded as 1 = Caucasian), 2 = Hispanic/Latino, 3 = African/African American, 4=American Indian/Alaskan native, and 5 = Asian/Pacific Islanders. "Study area" was coded as 1 = Health sciences, 2 = Arts and sciences and 3 = Education and human development. For the regression analyses, the nominal variables with greater than two categories were dummy coded into dichotomous variables; the process is described later in this chapter.

Procedure

Data Collection

After permission to access students for the survey was obtained from the Institutional Review Board of the University of North Dakota, a complete list of email addresses of all the students enrolled full time in each of the graduate degree programs was obtained from the Office of Institutional Research. The survey questionnaire was then distributed via the Survey Monkey electronic survey system. Reminder emails were sent at two and four weeks. Completion and submission of the survey was considered

the consent to participate. Upon receipt of the completed survey, the participant's email was entered into the face page of the electronic survey; a statement was included that assured participants that there were no known risks associated with their participation in the study and no direct benefit from the participation was expected. Upon receipt of the completed survey, the students' email addresses were entered in a drawing for a chance to win one of two 4th Generation Apple iPod Touch.

Data were analyzed in order to determine the percentages of missing data in the entire data set: there were no missing data or variables. Survey responses were entered into an IBM SPSS Statistics Professional Edition, 2011 for analysis. The database was stored on a secure dedicated research laptop computer. Data were backed up on a research dedicated external storage device (USB memory stick). The original paper-based surveys are housed in a secure filing cabinet for three years prior to being destroyed.

Data Analysis

The data were entered into Excel and IBM SPSS Statistics Professional Edition, 2011 for immediate analysis. Prior to analysis, the data were inspected and verified by a doctorally prepared nurse researcher. After entering each set of data, it was reviewed and validated for accuracy of input.

Descriptive analyses included summary tables, charts, percentages, and measures of central tendencies (Mertler & Vannatta, 2007). Prior to conducting regression analysis, the data were screened for any omissions and/or outliers. Several linear and multiple regression analyses were utilized to check the correlations between independent and dependent variables as stated in hypotheses. Due to the presence of multiple

dependent and independent variables in the study, correlation matrices were created for all the variables. Psychometrics of all three scales (EBBS, ESES, and IPAQ) were verified by Cronbach alphas and exploratory factor analysis.

The Kolmogorov-Smirnov and Shapiro-Wilk tests were used to determine the distribution pattern of the principal variables. The p-values for both the tests were less than .05, indicating non- normal distribution of the data for age, BMI, all type of CVD knowledge score, exercise motivation, exercise-demotivation, all levels of physical activity (VPA, MPA, & Walking), and all type of self efficacies (task, coping, and scheduling).

Handling of Non-Normally Distributed Data

The seven socio-demographic variables were: age, gender, marital status, employment status, ethnicity, level of study, and broader area of study. Age was a continuous variable; gender, marital status, employment status, and level of study were dichotomous variables with only two categories. Ethnicity and broader study areas were categorical variables having more than 2 categories and thus needing transformation prior to their use in regression analysis.

Ethnicity had five categories (Caucasian, Hispanic/Latino, African/African American, American Indian/Alaska Natives, and Asian/Pacific Islander). Ethnicity was binary coded into four proxy variables commonly known as proxy variables (Table 9) using either 0 or 1 (Kennedy, 1981). In all proxies created, a zero score was assigned to "Caucasian" to be used as reference variable and either 0 or 1 was assigned to each of the other categories. Broader study area had three categories (health sciences, art and sciences, and education and human development); it was binary coded into two proxy

variables (Table 10). In both proxies, health sciences was assigned a zero. When the study area was art and sciences, it was assigned 1 and education and human development was assigned 0, and vice versa. In the analysis, "Health Sciences" was used as reference category.

To avoid the violation of the assumptions of normality of the data distribution for regression analysis, the Kolmogorov-Smirnov and Shapiro-Wilk tests were used to determine the data distribution pattern for the principal variables to be used in regression analyses. These tests were statistically significant at p-value less than .05 for the majority of the study variables tested. More specifically, age and total PA (MET-min) were positively skewed with respective skew values of 1.557 and .809. Task self-efficacy knowledge of CVD risk factors and knowledge of CVD prevention were significantly negatively skewed with the values of -1.393, -3.662, and -1.017.

Total PA as total MET-min scores combined for VPA, MPA, and Walking were transformed by replacing each measurement by its square root (Tabachnick & Fidell, 2007) resulting in a decrease in skew to .022 mimicking a normal or nearly normal distribution. Age was substantially positively skewed, and necessary transformation methods failed to achieve normality or near normality. This forced a decision to collapse it into three groups; 1 (20 -34 years), 2 (35-44 years), and 3 (45 years and above). This yielded three categories for age (Table 10) which were binary coded into two proxy variables with either 0 or 1. A zero score was assigned to "group 1" (20- 34 years) to use as the reference category. After transformation of task self-efficacy scores, the Kolmogorov-Smirnov and Shapiro- Wilk tests were still statistically significant; this indicated of these transformation methods to mathematically achieve normal distribution.

As shown in Table 10, the task self-efficacy scores were collapsed into three groups (1= low, 2= moderate, 3= high) as suggested by Tabachnick and Fidell (2007). Group 1, 2, and 3 had task self-efficacy scores of 0-49, 50-79, and 80-79 respectively. The new task self-efficacy variable was binary coded into two proxy variables called dummy variables. In both proxies, a zero score was assigned to "high score group" to use as the reference category.

Table 9. Binary Coding Method Used to Create Proxy Variables for Ethnicity.

Group	Proxy Variable 1	Proxy Variable 2	Proxy Variable 3	Proxy Variable 4
Caucasian	0	0	0	0
Hispanic/Latino	1	0	0	0
African/African American	0	1	0	0
American Indian/Alaska Natives	0	0	1	0
Asian/Pacific Islander	0	0	0	1
Reference ethnicity: Caucasian				

Table 10. Binary Coding Method Used to Create Proxy Variables for Broader Study Area, Task Self-Efficacy, and Age.

Group	Category	Proxy Variable 1	Proxy Variable 2
	Study Area		
1	Health Sciences	0	0
1	Art and sciences	1	0
2	Education and human development	0	1
Task Self-Efficacy			
1	Low (scores between 0-49)	0	1
2	Moderate (scores between 50-79)	1	0
3	High (scores between 80-100)	0	0
	Age		
1	Ages between 20-34	0	0
2	Ages between 35-44	1	0
3	Ages between 45 and above	0	1
Reference group: Area of study (Health Sciences); Task self-efficacy (high); Age (20-34)			

Final adjustment of the data was conducted for knowledge of CVD risk factors and CVD prevention. Both variables were heavily negatively skewed with values greater than negative one. Appropriate transformation methods failed to bring about a normal or

close to normal distribution. All the knowledge scores were summed to create a new variable. Consequential adjustment in the scores was able to significantly reduce skew to -.624 for the newly created knowledge variable (final CVD knowledge) with an acceptable skew compared to -3.662 for knowledge of CVD risk factors.

Protection of Human Subjects

To assure adequate protection of human subjects, Institutional Review Board (IRB) approval was granted from the University of North Dakota, IRB. An information letter describing the purpose of the survey and ensuring anonymity and confidentiality was part of the on line survey. The statement assured that there were no anticipated discomforts or risk associated with the study to the participating students. Students were also informed that participating or not participating in the study would not prejudice any future relations with the university and was completely voluntary. Confidentiality was maintained throughout data collection and data entry process. Participants were not asked to disclose any personal identifier (date of birth, name, social security number, address). The surveys were coded in order to remove any chance of participants being identified. This database was stored on a secure dedicated research laptop computer and USB memory-stick. The research laptop, memory-stick, and printouts are kept in a filing cabinet in a locked area (or building) and only accessible to the researcher and dissertation chair. The original paper-based surveys are housed in a secure filing cabinet for three years prior to being destroyed.

Summary

This chapter discussed the steps that were implemented to investigate the aims of this dissertation study as previously planned. The chapter began with the presentation of

the components of the research methodology including description of the research design, population, and sampling plan. Description of the customized survey packet was followed by the details of the data collection method and data analysis plan. Finally, the section concluded with the explanation of the measures used to protect human rights and confidentiality of the subjects during the course of this investigation.

CHAPTER IV

RESULTS

Chapter IV presents the description of the population of the study (N=349) followed by the results from the testing of the hypotheses. This will conclude with a summary of results description of overall statistically significant predictors of PA. A total of nine research questions related to graduate students' PA were addressed in this study: 1) what is the reported knowledge level about CVD, CVD risk factors, and CVD prevention strategies?, 2) How much knowledge about CVD is translated into actual CVD prevention practices in terms of PA?, 3) What differences in CVD knowledge and PA exist according to socio-demographic variables and academic area of studies?, 4) What motivating and de-motivating factors for exercise and PA are perceived?, 5) How much self-efficacy (task, coping, and scheduling) related to exercise and PA are perceived?, 6) What is the relationship between the level of exercise self-efficacy and the perceived motivating and de-motivating factors?, 7) What is the relationship between the level of perceived motivating and de-motivating factors for exercise and the degree of engagement in PA?, 8) What is the relationship between the levels of perceived exercise related self-efficacy and PA behavior?, and 9) What are the overall statistically significant predictors of PA?

Description of Study Population Based on Socio-Demographic Independent Variables

The descriptive characteristics of the entire sample (n=349) are presented in Tables 11-12. Age of the student participants in this study ranged from 22 to 59 years

with a mean of 29.5 (SD=8.36) years. The majority of the students (62.8%, n=219) were female. Approximately 83% (n = 289) self-identified themselves as Caucasians with only 2% (n=7) identifying as Asians/Pacific Islanders. Over two-thirds (69.9%; n= 244) stated they were enrolled in one of the master's degree programs; the remaining 105 (30.1%) were enrolled in various doctoral degree programs. Students enrollment in the arts and sciences (42.1%; n= 147) predominated, with health sciences enrollment second (38.7%; n=135) and only 19.2% (n=67) in education and human development related academic programs. More than half of the participants (54.7%) were never married and 38.4% were currently married: only 6.9% reported being divorced or separated. Nearly three-fourths of the married students (n=134) currently lived with their family while in school (72.4%; n=97). Eighty-two percent of the students (n=285) were currently employed. "Employed" meant part time, full time jobs outside of the university and jobs available within the university including graduate research assistant (GRA), graduate teaching assistant (GTA), and graduate service assistants (GSA). The distribution for current annual household income among these students was bimodal; 26.4% had between $10-20,000 per year and 28.9% greater than $30,000 per year; 18.6% of students had no income.

Personal Health Behavior of the Participants

Living unhealthy life styles increases the individual's likelihood of vulnerability to actual or potential cardiovascular diseases. The more people engage in unhealthy behaviors such as poor eating habits, lack of rest, insufficient physical activity, smoking, and alcohol drinking, the greater the risk of them experiencing adverse health effects such as increased rates of morbidity and/or mortality. The personal health behaviors reported

by the students are described below. This includes the frequency of physical activity level, smoking, and drinking behavior, problems with sleep/rest, fruits/vegetable intake, and their reported height/weight. Additionally, students' body mass index (BMI) as calculated from their self reported height in inches and weight in pounds is reported.

Table 11. Description of the Participants Based on Gender, Ethnicity, and Level of Study.

Characteristics	Frequency (N)	Percent (%)
Gender (%)		
Male	130	37.2
Female	219	62.8
Ethnicity		
Caucasian	289	83.0
Asian/Pacific Islander	30	8.6
Hispanic/Latino	10	3.0
African/African American	13	3.7
American Indian Alaska Natives	7	2.0
Level of Education		
Masters	244	69.9
Doctorate	105	30.1
Academic Area of Study		
Health Sciences	135	38.7
Art & Sciences	147	42.1
Education & Human Development	67	19.2

Table 12. Description of the Participants Based on Academic Area, Marital Status, Employment Status, and Annual Household Income.

Characteristics	Frequency (N)	Percent (%)
Marital Status		
Married	134	38.4
Divorced/Separated	24	6.9
Never Married	191	54.7
If Married, Living with Family?		
Yes	97	72.4
No	37	27.6
Currently Employed		
Yes	285	81.7
No	64	18.3
Annual Household Income		
Less than $10,000	48	13.8
$10,000 - $20,000	92	26.4
$20,000 - $30,000	43	12.3
Greater than $30,000	101	28.9
No income	65	18.6

Physical Activity and Exercise

Physical activity in this study, as conceptually defined and operationalized through the Internal Physical Activity Questionnaire (IPAQ), is the type of body movement produced by the contraction of skeletal muscle that increases energy expenditure above the basal level calculated in terms of MET-minute. The IPAQ suggests three levels of physical activity: inactivity, minimal activity, and health enhancing physical activity. Inactivity is category one and the lowest level of physical activity. Minimal activity or category two is classified by the following criteria: I) three or more days of vigorous PA of at least 20 minutes per day or II) five or more days of moderate PA or walking of at least 30 minutes per day or III) five or more days of any combination of activity achieving at least 600 MET-min/week. MET-min/week is calculated by multiplying the MET level by the minutes and days in a week that physical activity took place (medium MET value*minutes*days). The IPAQ has established median MET values for each of the activities (walking=3.3 METs, moderate PA= 4.0 METs, and vigorous PA=8.0 METs) (IPAQ, 2004). Category three is defined as I) vigorous PA on at least three days accumulating 1500 MET-min/week or II) 7 or more days of combination of any PA achieving a minimum of 3000 MET-min/week. Individuals who do not meet criteria for categories 2 or 3 are considered inactive.

Subjective exercise behavior in this study was measured using the IPAQ. The data were collected for the number of minutes of MPA and VPA and walking. Calculated mean duration of engagement in vigorous physical activity (VPA) by the entire sample was 109.5 minutes (SD= 101.86) per week, that for moderate physical activity (MPA) was 76.8 minutes (SD= 82.86) per week, and mean duration for walking per week was

124.26 (SD= 108) per minutes. The calculated mean MET, days, and minutes of VPA, MPA, walking, and total physical activity (vigorous, moderate, and walking combined) are shown in Table 13.

Table 13. Mean Scores and Standard Deviations for Days and Minutes of Self Reported VPA, MPA, and Walking.

PA Parameters	Frequency (N)	Mean	SD
Days of VPA	349	2.57	1.92
Minutes of VPA	349	31.48	20.74
Days of MPA	349	2.35	1.80
Minutes of MPA	349	24.86	18.48
Days of Walking	349	3.96	1.99
Minutes of Walking	349	26.72	18.08
Minutes reflect time spent doing each of PA			

Over the entire sample, 19.2% (n=67) students reported that they did not engage in any VPA and 17.8% (n=62) did not engage in any MPA during the past 7 days. Similarly, 8.3% (n=29) reported that they did not walk during past 7 days (Table 14). The sample was divided into three groups based on the amount of total PA they engaged in: high PA group (>1500 MET-min/week), moderate PA group (600-1500 MET-min/week), and low PA group (< 600 MET-min/week). Based on this grouping, 11.2% (n=39) students were found to be engaged in high level of PA, 67% (n=234) students in moderate PA, and only 21.8% (n=76) in low level of PA (Table 15 and Figure 4).

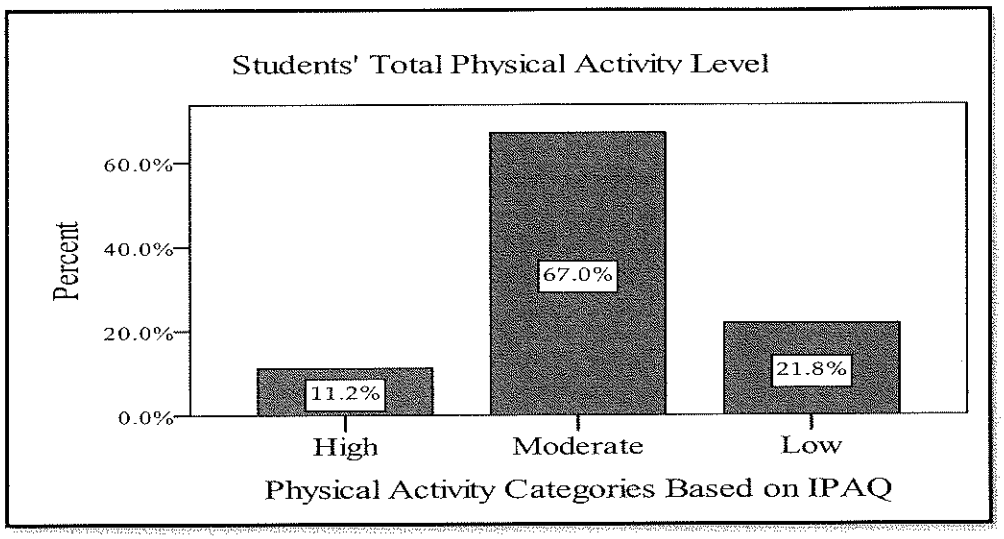

Figure 4. Student Engagement in Physical Activity by IPAQ Categories.

Table 14. Reported Days of Engagement in VPA, MPA, and Walking Past Seven Days.

	Categories	Frequency (N)	Percent (%)
Days Engaged in	More than 5 days	31	8.9
VPA Past 7 days	5 days	37	10.6
	4 days	48	13.8
	3 days	58	16.6
	2 days	52	14.9
	1 days	56	16.0
	No VPA	67	19.2
Days Engaged in	More than 5 days	31	8.9
MPA Past 7 days	4 days	29	8.3
	3 days	64	18.3
	2 days	79	22.6
	1 day	63	18.1
	No MPA	62	17.8
Days Walked	More than 5 days	117	33.5
Past 7 Days	5 Days	56	16.0
	4 Days	41	11.7
	3 Days	50	14.3
	2 Days	31	8.9
	1 Day	25	7.2
	No Walking	29	8.3

Table 15. Student Engagement in PA by IPAQ Categories (VPA, MPA, and Walking).

PA parameters	Frequency (N= 349)	Percent (%)
Highly active (total PA score ≥ 1500 MET-min/week)	39	11.2
Moderately active (total PA score ≥ 600 MET-min/week)	234	67.0
Inactive (total PA score <600 MET-min/week)	76	21.8

Height, Weight, and Body Mass Index

The body mass index (BMI) is an established health screening tool that has been used to identify overweight and obesity as the major contributors for CVD. These parameters are classified as health threats known to increase population morbidity and mortality from all causes (Sizer & Whitney, 2003). The negative consequences of obesity on overall health, longevity, and quality-of-life have well been acknowledged (AHA, 2008).

Participants in this study were asked to provide their height in inches and weight in pounds. The BMI value was then calculated based on the information provided. Table 16 shows that nearly half the students (47%; n=164) had healthy BMI values between 18.5 and 24.9 but 30.4% (n=106) of the students had values of 25.0 to 29.9 (overweight), and 20.3% (n=71) had values of 30.0 or greater (obesity). This means that over 50% of the students fell within the overweight or obesity BMI range. Only 2.3% (n=8) had BMI values in the underweight BMI range. The mean BMI value among students was 26 (Range = 22-59; SD = 3.8) with a median BMI of 25.01. The median BMI value was at the lower end of the overweight BMI range, indicating that 50% of the students were either overweight or obese. Figure 5 demonstrates that a greater percentage of female (54.8%) than male students (33.8%) were classified as "healthy" BMI. However, the

percentage "overweight" was greater among males (43.8%) than females (22.4%). This was also true for "obesity", with 22.3% males and 19.2% females being obese.

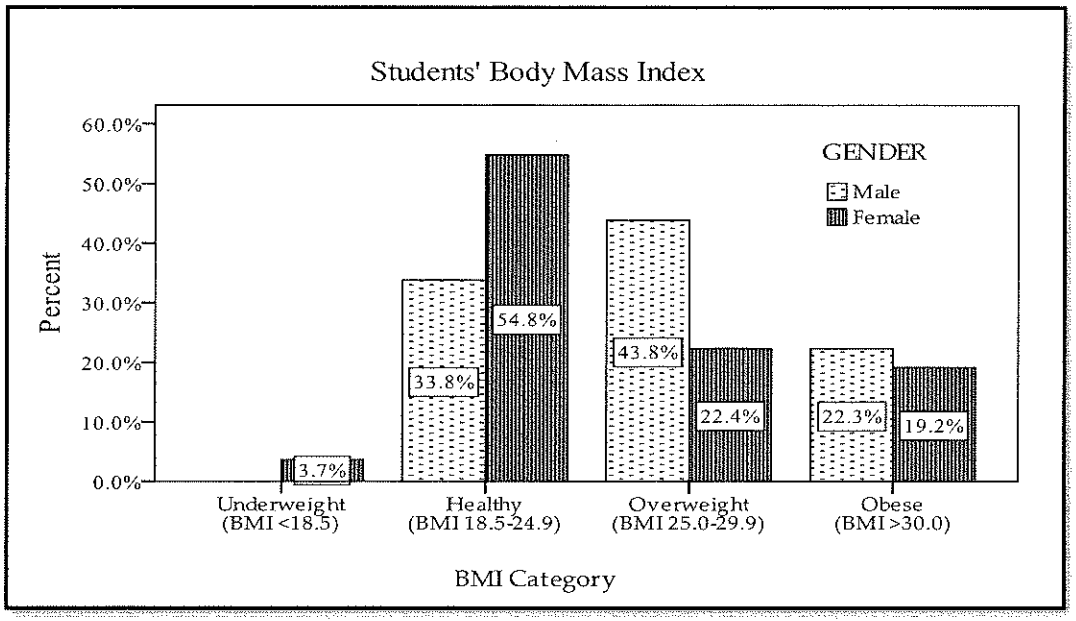

Figure 5. Gender Based Differences in Body Mass Index Categories.

Table 16. Calculated Body Mass Index (BMI).

Mean BMI 26.0 (Range 22-59; SD 8.36)		
BMI Range	Frequency (N)	Percent (%)
Underweight BMI range (<18.5)	8	2.3
Healthy BMI range (18.5-24.9)	164	47.0
Overweight BMI range (25.0-29.9)	106	30.4
Obese BMI range (>30.0)	71	20.3

Sleep and Rest

Evidence suggests that sleep deprived individuals have increased vulnerability to the development of CVD. Problems with sleep/rest were obtained by asking them whether or not they felt that they did not get enough sleep or rest during the past 30 days. As shown on Table 17, three-quarters (75.1%; n=262) of the students' responded that they had some problem sleeping or feeling rested. When asked to provide the specific

number of days that they did not have enough sleep or rest, out of the 262 indicating a problem with sleep/rest, 34.7% stated they did not feel like they had enough sleep or rest for seven or more days during the past 30 days, another 22.7% for 5-6 days, 26.3% for 4-5 days, and 16.4% for 1-2 days.

Smoking and Drinking Behavior

Over 80% (81.7%) of the students identified themselves as non smokers (never smoked); 12.9% reported they were ex-smokers; and only 5.4% identified themselves as current smokers (Figure 6). The majority (65.9%) indicated that they consumed alcoholic beverages (Figure 7).

Fruits and Vegetable Intake

Intake of fruits and vegetables tended to be low, with 74.1% reporting eating three servings or less daily; 20.1% reporting 4-5 servings daily, and 3.7% eating 6-7 servings daily: only 2% greater than eight servings daily (Table 18). Overall, only 25.8% of the students reported eating 4-8 servings of fruits and vegetables daily.

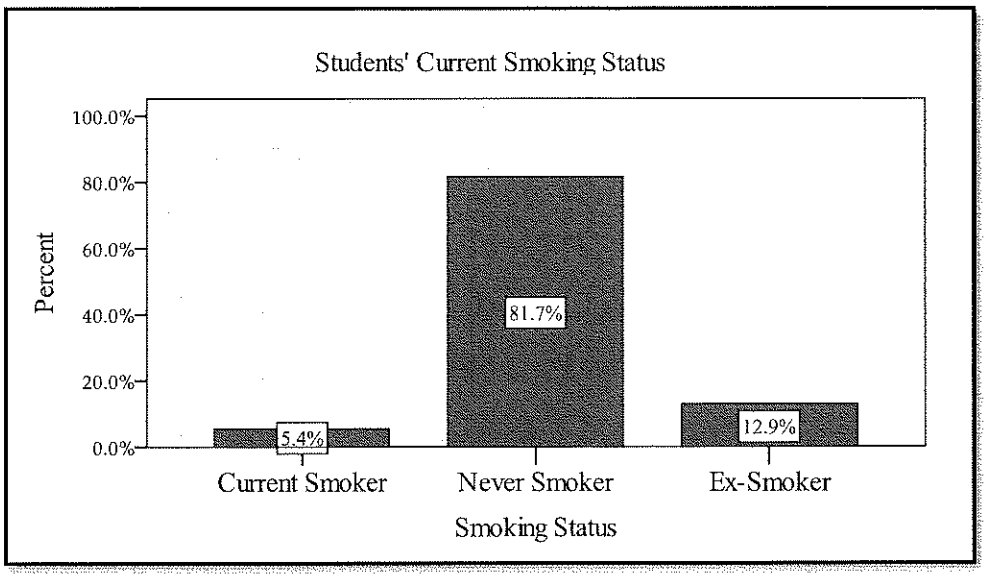

Figure 6. Students' Current Smoking Status.

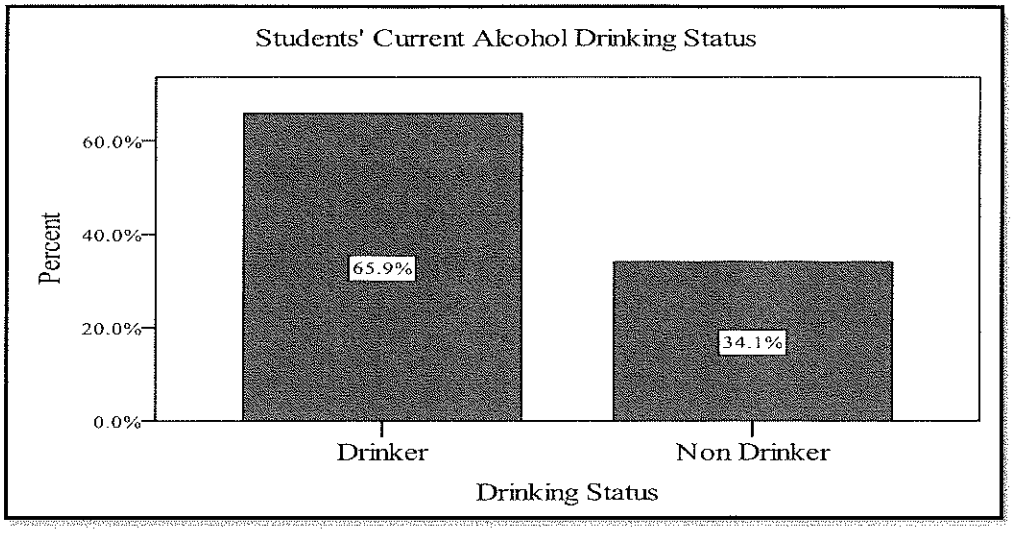

Figure 7. Students' Current Alcohol Drinking Status.

Table 17. Personal Health Behavior (Smoking, Alcohol Consumption, and Sleep and Rest).

Characteristics	Frequency (N)	Percent (%)
Smoking Behavior		
Never Smoked	285	81.6
Current Smoker	19	5.5
Ex-smoker	45	12.9
Current Drinking Behavior		
Current Drinker	230	65.1
Non Drinker	119	34.1
Sleep and Rest Problem		
Yes	262	75.1
No	87	24.9
Days Had Sleep/Rest Problem		
1-2 days	45	16.7
3-4 days	70	26.0
5-6 days	61	22.7
7 days or more	94	34.6

Results Related to Study Questions and Hypotheses

Research question 1

What is the reported knowledge level about CVDs, CVD risk factors, and CVD prevention strategies?

Hypothesis 1: Graduate students will have a moderate amount of knowledge concerning various CVDs, CVD risk factors, and CVD prevention strategies.

Table 18. Personal Health Behavior (Fruits, Vegetable Intake, and Physical Activity).

Characteristics	Frequency (N)	Percent (%)
Reported Fruits & Vegetables Intake		
0 - 1 serving	72	20.7
2 - 3 servings	186	53.4
4 - 5 servings	70	20.1
6 - 7 servings	13	3.7
8 servings or more	7	2.0
Physical Activity Level		
High (PA score $\geq$ 1500 MET-min/week)	39	11.2
Moderate (PA score $\geq$ 600 MET-min/week)	234	67.0
Low (PA score < 600 MET-min/week)	76	21.8

This hypothesis was tested by measuring participating students' CVD knowledge in three distinct areas: 1) knowledge of various cardiovascular diseases, 2) knowledge of CVD risk factors, and 3) knowledge of CVD prevention strategies. The knowledge questionnaire contained four multiple-choice questions. The first three questions addressed CVD knowledge and the fourth question concerned students' knowledge of their perception of CVD self-risk. The CVD knowledge questions included choices about various types of cardiovascular diseases, general CVD risk factors, and general CVD prevention strategies. The response choices were based on the elements of CVD, their risk factors, and prevention strategies such as exercise and physical activity, weight management, nutrition, blood pressure control, cholesterol control, and smoking. Participants were required to select at least four common CVD conditions (out of 8), five common CVD risk factors (out of 10), and five commonly utilized CVD prevention strategies (out of 10). They were also asked to select their own risk of having CVD; high risk, moderate risk, or low risk based on the responses for knowledge questions. A

summed score was calculated for each knowledge question. For the final correlational analyses, a final score combining all three areas was calculated because CVD knowledge scores were not normally distributed.

For the entire sample, the mean knowledge score for various CVDs was 5.56 (SD= 1.76) out of a range of 0 to 8, the mean score for CVD risk factors knowledge was 9.80 (SD= 0.69) out of a range of 0 to 10 and the mean knowledge score for CVD prevention strategies was 8.77 (SD= 1.55) out of a range of 0 to 10 (Table 19). This indicates a high level of knowledge among this sample in regard to various CVDs, CVD risk factors and CVD prevention practices.

Table 19. Mean CVD Knowledge Scores for Entire Sample.

CVD Knowledge Area	Frequency (N)	Mean	SD
Knowledge of various CVDs	349	5.56	1.768
Knowledge of CVD risk factors	349	9.80	0.691
Knowledge of CVD prevention strategies	349	8.77	1.557
Aggregate CVD knowledge	349	24.27	2.641

The correct percentages of responses concerning knowledge of specific CVD, CVD risk factors, and CVD prevention strategies are shown in Tables 20-22. Over two-thirds (75%) of the students recognized heart attack and heart failure (71.3%) as types of CVD, with lower percentages being cognizant of peripheral vascular disorders (52.0%), heart rhythm disorders (46.1%), and stroke (30.0%). High percentages of the students recognized elevated cholesterol (89.0%), high blood pressure (87.0%), overweight (85.0%), and family history (79.0%) as major risk factors for CVD. Moderate percentages recognized smoking (63.0%) and physical inactivity (50.0%) as risk factors, and only 38.0% selected diabetes as a CVD risk factor.

Almost all (95.0%) of the students identified maintaining ideal body weight and engaging in regular PA as CVD prevention strategies. Quitting smoking was identified as such by 83.0%. Other CVD prevention strategies identified by much lower percentages of students were keeping one's cholesterol <200 mg/dl (60.0%), controlling blood pressure if it is elevated > 20 points (45.0%), controlling blood glucose if diabetic (40.0%), and controlling blood pressure if it is elevated > 10 points (31.0%).

Table 20. Percentages of Correct Response for Knowledge about Various CVDs.

Common CVDs	Frequency (N)	Percent (%)
Heart Attack	263	75.4
Heart Failure	249	71.3
Peripheral Vascular Disorders	182	52.1
Heart Rhythm Disorder	161	46.1
Stroke	115	33.0

Table 21. Percentages of Correct Response for Knowledge about CVD Risk Factors.

Common CVD Risk Factors	Frequency (N)	Percent (%)
High Cholesterol	310	88.8
High Blood Pressure	304	87.1
Overweight	295	84.5
Family History of CVD	274	78.5
Smoking	218	62.5
Physical Inactivity	175	50.1
Diabetes	134	38.4

Figure 8 shows the cumulative knowledge scores about CVD conditions as the differences in the percentages. The largest percentage of students (41.8%) identified Three CVD conditions, 22.1% were able to identify Four, and 28.4% identified only two conditions. Only 7.7% identified one or no conditions. Knowledge of CVD risk factors was high (Figure 9), with 91.4% of the students able to identify all five risk factors listed. Knowledge of CVD prevention strategies was moderate (Figure 10), with 55.0% able to

identify all five CVD prevention strategies listed and 29.8% able to identify four strategies.

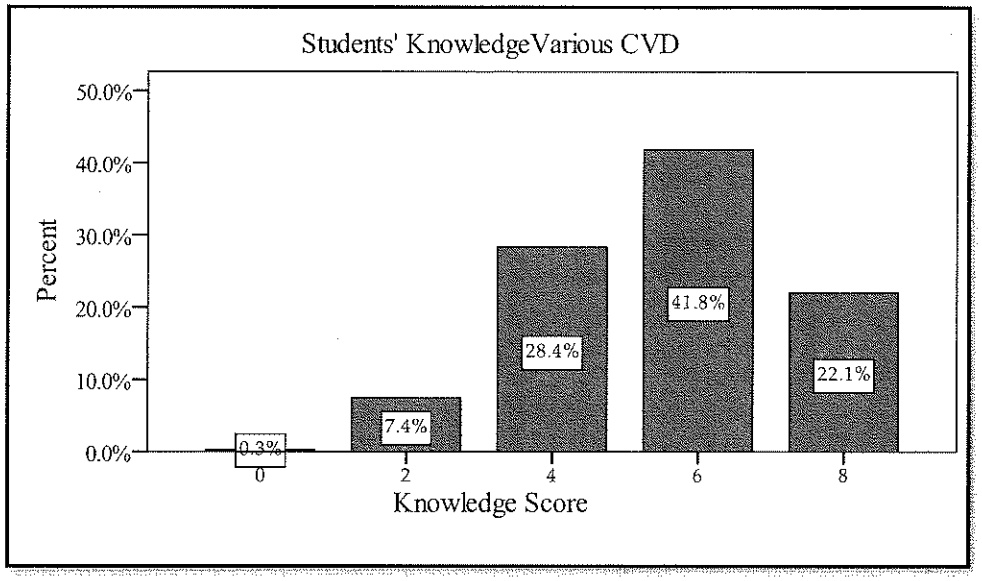

Figure 8. Differences in Percentage of Correct Responses Identified for Knowledge about Cardiovascular Disease Conditions.

Table 22. Percentages of Correct Response for Knowledge about CVD Prevention Strategies.

Common CVD Prevention Strategies	Frequency (N)	Percentage (%)
Maintaining Ideal Body Weight	333	95.4
Regular Physical Activities	330	94.6
Quitting Smoking if Smoker	288	82.5
Keeping Cholesterol < 200 mg/dl	209	59.9
Controlling BP if it is elevated > 20 points	156	44.7
Controlling Blood Glucose if Diabetic	138	39.5
Controlling BP if it is elevated > 10 points	109	31.2

Slightly over half (51.3%) perceived themselves to be at lower risk, 41.8% perceived themselves to be at moderate risk, and only 6.9% (n= 24) perceived themselves to be at high risk of having CVD (Figure 11).

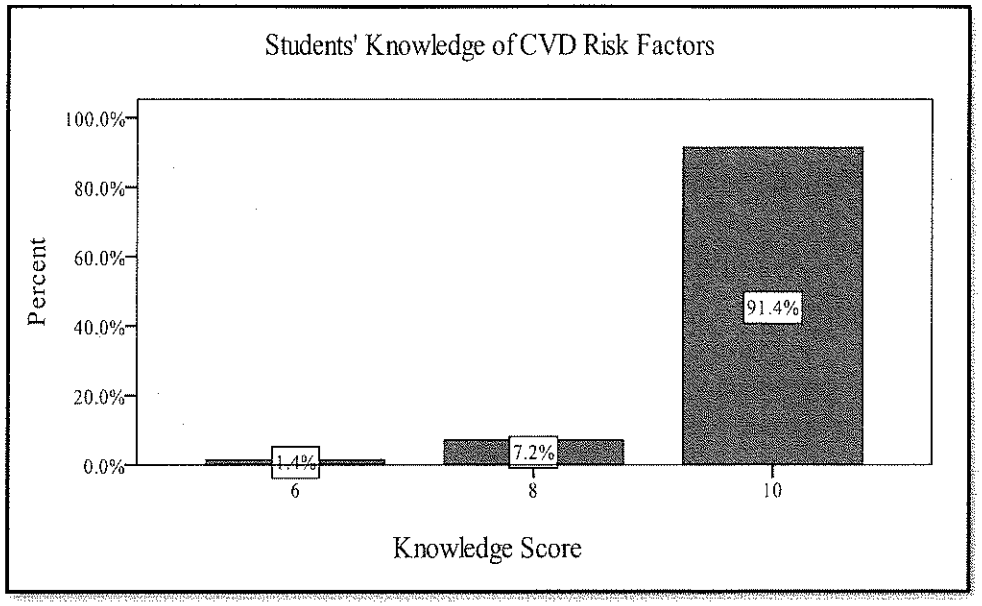

Figure 9. Differences in Percentage of Correct Responses Identified for Knowledge about Cardiovascular Diseases Risk Factors.

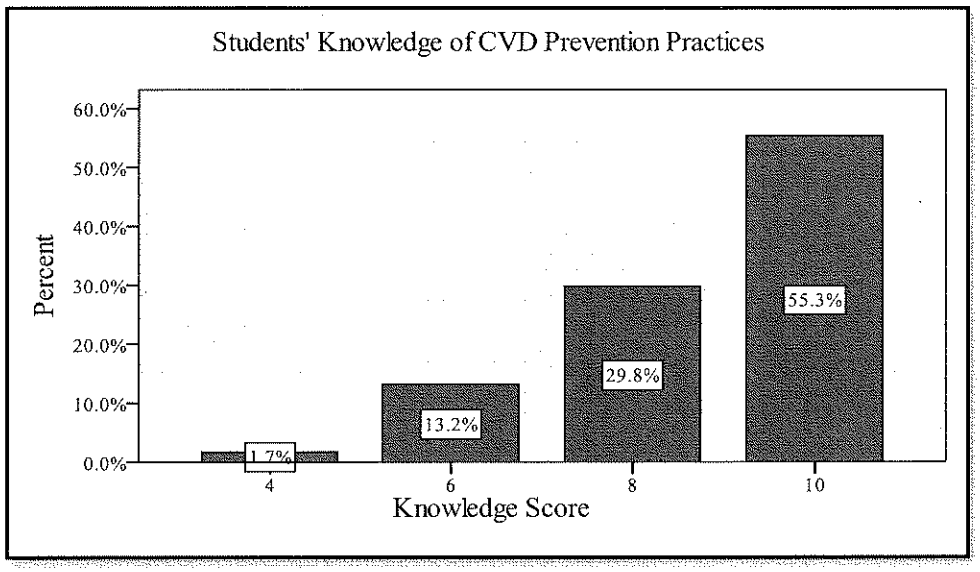

Figure 10. Differences in Percentage of Correct Responses Identified for Knowledge about Cardiovascular Diseases Prevention Strategies.

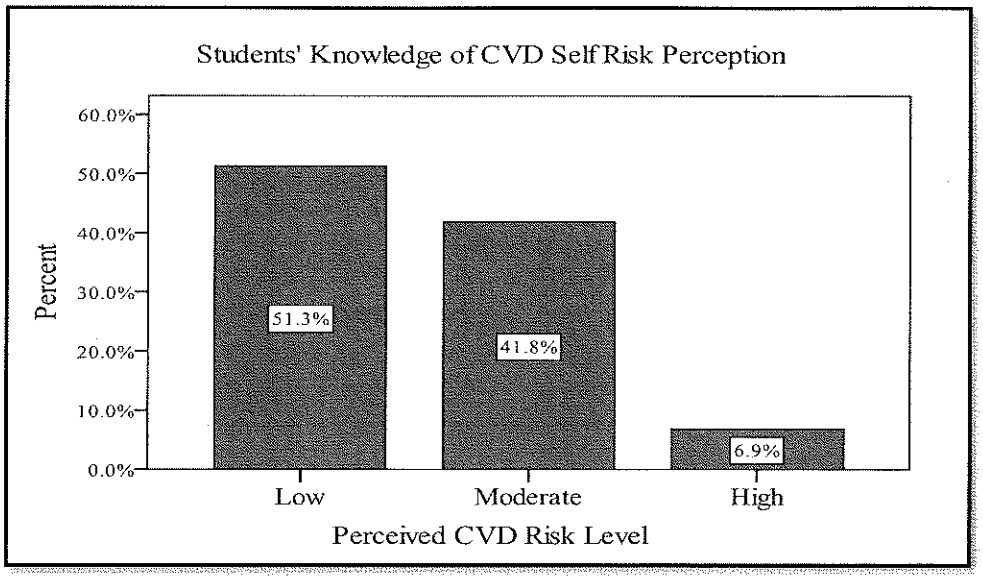

Figure 11. Percentages of Self Cardiovascular Diseases Risk Perception among All Participants.

As hypothesized, this graduate student population was moderately high to very high in their level of knowledgebase about CVDs, including risk factors and prevention strategies. Nevertheless, only a very small percentage considered themselves at high risk of developing CVDs.

Research Question 2

How much knowledge about CVD is translated into actual CVD prevention practices in terms of physical activity?

Hypothesis 2: There will be no relationship between knowledge about CVD and their engagement in PA. For this analysis, engagement in actual CVD prevention practices in terms of total PA was calculated as total MET-Minute per week combined for vigorous, moderate PA, and walking. Total MET-Minutes per week was the dependent variable. Final CVD knowledge scores based on three different types of knowledge was the predictor variable. Simple bivariate regression analysis tested the hypothesis that there was no relationship between the level of CVD knowledge and PA (Table 23). The

final CVD knowledge score was not found to be correlated with students total physical activity measured in terms of total MET-min per week (β= .047, p = .379). Therefore, the null hypothesis of no relationship between knowledge of CVD and actual engagement in PA was accepted.

Table 23. Result of Bivariate Regression Analysis Showing Correlation between CVD Knowledge and Physical Activity.

Predictor Variable	Beta	β	t
CVD Knowledge combined for knowledge of various CVDs, risk factors for CVD, and CVD prevention strategies.	.275	.047	.881
Model R^2= .002, F= .777, p= .379			

Research Question 3

What are the differences in CVD knowledge and physical activity behavior according to socio-demographic factors and academic area of studies?

Hypothesis 3: There will be no difference in knowledge about CVDs according to socio-demographic variables. A multiple regression analysis, with the five socio-demographic measures as independent variables, was used to test the third hypothesis (H3). The socio-demographic factors used as "independent variables" were age, gender, ethnicity, level of study, and area of study. "Final CVD Knowledge" was the dependent variable.

"Level of Study" and "Broader area of Study" were significantly correlated with the final CVD knowledge score. Students' enrolled in doctoral degree programs had a higher level of CVD knowledge (β= .186, p= .000). Students enrolled in the arts and sciences (β= -.217, p= .000) and education and human development (β= -.152, p= .008) had significantly lower levels of CVD knowledge compared to students enrolled in any of

the health science programs. Age, gender, and ethnicity were not significantly correlated with CVD knowledge.

The hypothesis was also tested by exploring partial correlation coefficient values of the variables having significant correlation to the outcome variable after controlling for all other socio-demographic variables. The semi partial correlation coefficient for level of study was .192 (t= 2.60, p= .000), -.193 (t= -3.613, p= .000) for art and sciences, and -.143 (t= -2.656, p= .008) for education and human development as academic areas of study.

As shown in Table 24, the final regression model was statistically significant [R^2= .111 (10, 338) p= .000]; the five socio- demographic variables together explained 11% of the variance in CVD knowledge.

Table 24. Results from Multiple Regression Analysis: Socio-Demographic Variables and CVD Knowledge.

Demographic Variables Entered	Beta	β	t	Semi Partial Correlation
Age Group				
35-44 Y	.578	.081	1.557	.084
45-Above	.416	.044	.825	.045
Gender	.091	.017	.318	.017
Ethnicity				
Hispanic/Latino	1.432	.094	1.766	.096
African/African American	-.098	-.007	-.141	-.008
AI/AN	-.339	-.019	-.361	-.020
Asian/Pacific Islander	.001	.000	.003	.000
Level of study	1.037	.186	3.602	.192**
Broader study area				
Art and Sciences	-1.119	-.217	-3.613	-.193**
Ed. & Human Dev.	-.985	-.152	-2.656	-.143**

** Correlation is significant at p value <.01
Final model R^2= .111, F= 4.219, p= .000

Hypothesis 4: There will be no difference in physical activity behavior according to socio-demographic variables. The results for hypothesis 4 are presented in terms of both descriptive and inferential statistics. Table 25 shows mean differences in MET level

according to each of the socio-demographic variables. A multivariate analysis examined the significant correlations between the students' "total physical activity" level and all socio-demographic independent variables (Table 26).

The highest means (MET-min per week of 1600 or greater) were for Caucasians, master's level students, students enrolled in health sciences programs, males, single students, and unemployed students. The lowest means (1300 or less MET-min. per week) were for those of other than Caucasian ethnicity.

Table 25. Mean Differences in the Reported MET-Min per Week Based on Socio-Demographic Variables.

Demographic Variables		N	Mean (MET minutes per week)	SD
Ethnicity	Caucasians	289	1676	1140
	Hispanic/Latino	10	1455	1034
	African/African Americans	13	1245	1005
	American Indian/AN	7	1281	751
	Asian/Pacific Islanders	30	1076	950
Study Level	Doctorate	105	1396	1332
	Masters	244	1679	1149
Gender	Male	130	1719	1216
	Female	219	1520	1058
Study Area	Health Sciences	135	1726	1101
	Art and Sciences	147	1499	1149
	Education and Human Dev.	67	1535	1092
Marital Status	Single	215	1744	1182
	Married	134	1352	974
Employment Status	Employed	285	1527	1103
	Unemployed	64	1891	1162

The multiple regression analysis (Table 26) showed the following variables to be significantly but negatively correlated with total PA: level of study (β= -.136, p= .010), academic area (β= -.175, p= .007), and marital status (β= -.213, p= .000). Doctoral students, despite having higher levels of CVD knowledge, engaged in significantly less amount of actual physical activity compared to their masters' degree counterparts. This was also true of those students enrolled in arts and sciences programs compared to those

enrolled in the health sciences and married students compared to single students. Gender, age, ethnicity, education and human development, and employment status were not significantly related to total PA level.

Unique contributions of the variables that are significantly correlated with total physical activity were also found to have contributed significantly to the total PA level based on partial semi correlations coefficients as shown in Table 26. After controlling for all socio-demographic variables, the semi partial correlation coefficient for level of study was -.139 (t= -2.579, p= .01). The value was -.147 (t= -2.718, p= .007) for art and sciences as an academic area of study and for marital status it was -.205 (t= -3.838, p= .000).

Table 26. Relationship between Students' Total Physical Activity Level and Socio-Demographic Variables: Multiple Regression Analysis.

Predictor Variables	Beta	β	t	Semi Partial Correlation
Age Group				
35-44 years	.763	.018	.335	.018
45 years and above	-1.644	-.030	-.549	-.030
Gender	-2.911	-.095	-1.723	-.094
Marital status	-6.520	-.213	-3.838**	-.205
Ethnicity				
Hispanic/Latino	-6.104	-.069	-1.280	-.070
African/African Americans	-4.193	-.053	-1.021	-.056
American Indians/Alaska Natives	6.627	.063	1.196	.065
Asian/Pacific Islanders	.032	.001	.011	.001
Level of study	-4.401	-.136	-2.579**	-.139
Broader study area				
Art and Sciences	-5.266	-.176	-2.718**	-.147
Education and Human Development	-2.462	-.065	-1.109	-.060
Employment status	-3.749	-.098	-1.765	.078

** Correlation is significant at p value <.01, Final model R^2= .099, F= 3.067, p= .000
DV: Total MET-Min per week combined for VPA, MPA & Walking

Research Question 4

What motivating and de-motivating factors for exercise and physical activity are perceived?

Hypothesis 5: There are no physical, social, and psychological cognitive factors that either motivate or de- motivate engagement in exercise and physical activity. Mean scores were calculated for the exercise benefits scale, the exercise barriers scale, and the sub-scales for motivating factors or exercise benefits (life enhancement, physical performance, psychological outlook, social interaction, and preventive health) and de-motivating factors or exercise barriers (exercise milieu, time expenditure, physical exertion, and family discouragement). Based on scoring guidelines for the *Exercise Benefits and Barriers Scale* (EBBS), total scores ranged from 43 to 172, with higher scores meaning greater motivation to engage in PA. The ranges for the exercise benefits and exercise barriers scales were 67 to 116 (out of 29-116) and 24 to 56 (out of 14-56), respectively. A higher score on the benefits scale indicates greater perceived benefits, and a lower score on the barriers scale indicates greater perceived barriers (Sechrist et al., 1987).

The mean scores for exercise benefits (motivating factors) (93.81) and exercise barriers (de-motivating factors) (41.54) were both high. This suggests that the graduate students studied here were highly motivated than de-motivated to engage in exercise and PA. In Table 27, the five factors in the exercise benefits subscale (29 items) and the four factors in the barriers subscale (14 items) are placed under broader categories pertaining to physical, social, and psychological elements of exercise benefits and barriers. The exercise benefits sub scale (motivating factors) includes life enhancement, physical performance, psychological outlook, social interaction, and preventive health. The barriers sub scale (de-motivating) consists of subscales for exercise milieu, time expenditure, physical exertion, and family discouragement. Under exercise benefits,

physical performance had the highest mean score (3.46), followed by psychological outlook (3.35), preventive health (3.31), and life enhancement (3.19). Under exercise barriers, physical exertion (3 items) and time expenditure (3 items) had the lowest means, 2.39 and 2.87, respectively but exercise milieu and family discouragement had the highest means, 3.24 and 3.13 respectively, showing their lack of importance as barriers for engaging in PA.

Table 27. Motivating and De-Motivating Subscales for Exercise and PA: Means and Standard Deviations.

Motivating or De-motivating Subscales	Mean	SD
Motivating subscales (perceived benefits to exercise; 29 items)	3.23	0.39
Physical performance (8 items)	3.46	0.40
Psychological Outlook (6 items)	3.35	0.50
Preventive Health (3 items)	3.31	0.49
Life Enhancement (8 items)	3.19	0.76
Social Interaction (4 items)	2.61	0.58
De-motivating subscales (perceived barriers to exercise; 14 items)	2.96	0.41
Physical Exertion (3 items)	2.39	0.60
Time Expenditure (3 items)	2.87	0.60
Family Discouragement (2 items)	3.13	0.75
Exercise Milieu (6 items)	3.24	0.47

Table 28 shows the ten most frequently reported direct benefits of exercise: 1) exercising improves the way the body looks (mean= 3.87), 2) exercise increases my level of physical fitness (mean= 3.66), 3) exercise improves functioning of my CV system (mean= 3.56), 4) exercise increases my muscle strength (mean= 3.53), 5) exercise gives me a sense of personal accomplishment (mean= 3.52), 6) exercise improves my mental health (mean= 3.47), 7) my muscle tone is improved by exercise (mean= 3.47), 8) exercise decreases feelings of stress & tension for me (mean= 3.44), 9) I have improved feelings of well being from exercise (mean= 3.41), and 10) I will live longer if I exercise

(mean= 3.4). Over 60% strongly agreed that "exercise increased my level of physical fitness;" while the lowest percent strongly agreed that "I live longer if I exercise." Five out of the ten direct benefits were categorized under physical performance and four under psychological outlook; this indicated the importance of those categories of benefits for the graduate students.

Table 28 identifies the motivators for exercise with the corresponding subscale. The item means Item means showed four subscales to be the major elements motivating students to engage in exercise and PA: physical performance, psychological outlook, life enhancement, and preventive health. Social interaction (mean = 2.61) was not found to be an important motivating element.

Table 28. Ten Most Frequently Reported Benefits for Physical Activity by Graduate Students.

Motivators for Exercise	Benefits Subscale	Mean	Agreement	
			SA (%)	SD
Improves the way the body looks	Physical Performance	3.87	44.4	2.6
Increases my level of physical fitness.	Physical Performance	3.66	66.2	0.3
Improves functioning of my CV system	Physical Performance	3.56	57.6	0.2
Increases my muscle strength.	Physical Performance	3.53	54.2	0.4
Gives me a sense of personal accomplishment	Psychological Outlook	3.52	57.0	0.3
Improves my mental health	Psychological Outlook	3.47	50.1	0.3
Muscle tone is improved	Physical Performance	3.47	48.7	1.4
Decreases feelings of stress & tension for me.	Psychological Outlook	3.44	51.0	0.9
Improved feelings of well being from exercise.	Psychological Outlook	3.41	46.1	0.6
Live longer if I exercise	Preventive Health	3.40	43.6	0.3

SA= 4, SD= 1; higher the mean the higher the perceived benefits for exercise (motivating factor)

Table 29 shows the four specific barriers reported in terms of degree of agreement (strongly agree =1) and mean calculation; 1) exercise tires me (mean= 2.30), 2) exercise is hard work for me (mean= 2.39), 3) I am fatigued by exercise (mean= 2.49), and 4)

exercising takes too much of my time (mean= 2.6). Three out of four items were categorized as physical exertion and one item as time expenditure.

Table 29 shows that physical exertion and time expenditure were the major potential de-motivators for physical exercise. Exercise milieu (mean= 3.24) and family discouragement (mean= 3.13) were not seen to be important de-motivating factors.

Table 29. Top Four De-motivating Factors for Physical Activity Reported by Students.

Exercise Barriers	Subscale	Mean	SA (%)	SD (%)
Exercise tires me.	Physical exertion	2.30	12.0	4.3
Exercise is hard work for me.	Physical exertion	2.39	12.0	8.0
I am fatigued by exercise.	Physical exertion	2.49	06.0	5.4
Exercising takes too much of my time.	Time expenditure	2.60	18.0	7.4

SA= 1, SD= 4 Lower the mean the lower the perceived barriers for exercise

Overall, this sample perceived more benefits than barriers for PA. Physical performance, life enhancement, psychological outlook, and preventive health were the most prominent motivating factors for exercise, and physical exertion and time expenditure were relatively strong de-motivating factors. Environmental elements such as social interaction, exercise milieu and family discouragement were not seen as important for engagement in PA.

Research Question 5

How much task, coping, and scheduling self-efficacy related to exercise and physical activity is perceived?

Hypothesis 6: Graduate students will perceive a moderate amount of task, coping, and scheduling self-efficacy related to exercise.

Exercise self-efficacy was assessed with the 9-item, 10 point Likert *Multidimensional Self-efficacy Scale* (Rodgers et al. 2008), which ranged from used 0%

(no confidence) to 100% (absolute confidence). Table 30, compares the mean scores for each of the subscales. The mean score for task self-efficacy (3 items) was 78.64, that of coping self-efficacy was 51.44 (3 items), and for scheduling self-efficacy it was 61.72.

Table 30. Descriptive Statistics of Self-Efficacy Sub-Scales: Mean Scores.

Subscale	Mean	SD	Low (0-49)	Moderate (50-79)	High (80-100)
			Percentage		
Task self-efficacy	78.64	20.71	07.4	29.2	63.3
Coping self-efficacy	51.44	23.87	42.7	44.4	12.9
Scheduling self-efficacy	61.72	28.05	33.5	32.1	34.4

Table 31 shows the frequency distribution of each of the items on the coping, task, and self-efficacy scales with their respective Pearson's chi-square values. The variation in the scores for each item in the three self-efficacy scales is statistically significant. The results indicated that 35% of the students were highly confident that they could exercise even when they were uncomfortable. Yet, only 23% were fully confident they could exercise when they lacked energy. More significantly, only 10% expressed absolute confidence in their ability to exercise when not feeling well. On the other hand, students' task self-efficacy levels were significantly high; 62% reported absolute confidence in performing using the proper technique, 71% confidence in following directions, and 67% confidence in performing all of the required movements. A moderate amount of scheduling self-efficacy was expressed; 43% were fully confident they could include exercise in their daily routine, 33% could consistently exercise five times in a week, and 41% saw themselves as able to arrange their schedule to include regular exercise.

Table 31. Comparison of Scores on Coping, Task, and Scheduling Self-efficacy: Chi-Square for Goodness of Fit.

#	Sub Scale	How confident are you that you can.....	Score Range (%)			Pearson's X^2
			0-49	50-79	80-100	
1	Coping	You feel discomfort	27	38	35	63.926
2		Exercise when you lack energy	3	44	23	56.046
3		Exercise when don't feel well	55	34	10	72.436
4	Task	Complete exercise using proper technique	8	30	62	271.250
5		Follow directions to complete exercise	7	23	71	427.960
6		Perform all of the required movements	7	26	67	330.570
7	Scheduling	Include exercise in daily routine	23	35	43	112.400
8		Consistently exercise five times in a week	35	32	33	43.060
9		Arrange schedule to include regular exercise	27	33	41	75.020
All Chi Square values were significant at the .000 level.						

In summary, the participants in this study had a moderate level of task self-efficacy (mean = 78.64). This implies that these students were moderately certain that they could complete exercise using proper technique, follow directions to complete exercise, and perform all of the required movements. On the contrary, they had a low to moderately low level of perceived coping self-efficacy (mean = 51.44). This mean score was at the lowest end of the "moderately can" category. Therefore, they were lacking confidence to exercise while challenged by adverse situations such as feeling uncomfortable, lacking energy, and not feeling well. Scheduling self-efficacy had a mean score of 61.72, a value at the lower end of "moderately can." They were barely confident that they would be able to include exercise in their daily routine, consistently exercise five times per week, or arrange their schedule to include regular exercise.

Research Question 6

What is the relationship between the levels of exercise self-efficacy and perceived motivating factors?

Hypothesis 7: There will be no relationship between the level of motivating factors and exercise self-efficacy after controlling for socio-demographic factors. Controlling for the socio-demographic variables, partial correlations between the exercise benefits (exercise motivation) scores and the scores for the three types of self-efficacy were conducted. The results are shown in Table 33. Exercise benefits/motivators were significantly correlated with moderate task self-efficacy ($r = -.156$, $p = .004$), a zero-order correlation of -.168 ($p = .002$). Controlling for the socio-demographics made little difference. Low task self-efficacy also had a significantly negative partial correlation ($r = -.193$, $p. = .000$) with exercise benefits/motivators. The zero order correlation was also relatively unchanged ($r = -.186$, $p. = -.186$). The same pattern of relationships was exhibited for the correlations between perceived motivation and coping and scheduling self-efficacy. Scheduling self-efficacy was positively partially correlated with exercise benefits ($r= .425$, $p= .000$) with a relatively similar zero order correlation ($r= .438$, $p= .000$). Finally, coping self-efficacy was partially correlated with benefits score ($r= .360$, $p= .000$) with similar zero order correlation ($r= .372$, $p= .000$). In all cases, the partial correlation coefficients were smaller than zero-order correlations but continued to be statistically significant.

The null hypothesis for the relationship between the three types of self-efficacy and motivation was not accepted. Controlling for socio-demographic variables had minimal effect on the statistically significant correlations between the exercise benefits score and the various self-efficacy scores (Table 32).

Table 32. Motivators for Exercise and Three Types of Self-Efficacy: Zero Order and Partial Correlations after Controlling for Socio-Demographic Variables.

Motivating Factors	Zero-order Correlation	Sig.	Partial Correlation	Sig.
Task self-efficacy				
Moderate	-.168	.002	-.156	.004
Low	-.186	.000	-.193	.000
Coping self-efficacy	.372	.000	.360	.000
Scheduling self-efficacy	.438	.000	.425	.000

Research Question 7

What is the relationship between the level of perceived motivating and de-motivating factors for exercise and the degree of engagement in PA?

Hypothesis 8: There will be no relationship between the level of perceived motivating factors and the degree of engagement in exercise and PA.

Hypothesis 9: There will be no relationship between the level of perceived de-motivating factors and the degree of engagement in exercise and PA.

These hypotheses were tested with multivariate analyses. The first analysis tested the relationship between total PA and the exercise benefits and exercise barriers scores as predictors (Table 33). Both scores were significantly correlated with total PA. The exercise benefits score was highly correlated with PA (β= .314, p= .000) validating that students perceiving greater benefits for PA were highly involved with actual exercise behavior. Similarly, exercise barriers score were also highly positively correlated with PA (β= .200, p= .000) validating that the students scoring high in barriers scale were less de-motivated thus participated in more PA.

When exercise barriers scores were controlled in the equation, the semi partial correlation coefficient for exercise benefits scores was .290 (t= 5.638, p= .000).

Similarly, when scores for exercise benefits was controlled, the semi partial correlation coefficient for exercise barriers score was .189 (t= 3.588, p= .000).

Table 33. Relationship between Total PA and Exercise Benefits and Barriers Scores: Multivariate Regression.

Predictors	Beta	β	t	Semi Partial Correlation
Exercise Benefits Score	.407	.314	5.638**	.290
Exercise Barriers Score	.509	.200	3.588**	.189

** Correlation is significant at p value <.001
Final Model R^2= .202, F= 43.692, p= .000

The second analysis addressed the five motivating factors and four de-motivating factors as the predictors of total PA (Table 34-35). Of the motivating factors for exercise, only psychological outlook (β= .362, p= .000) and social interaction (β= .195, p= .001) were significantly related to total PA. The semi partial correlation coefficient for psychological outlook as a motivating factor for exercise was .248 (t= 4.747, p= .000) after controlling for all other factors. Likewise, the semi partial correlation coefficient for social outlook after controlling for other factors was .173 (t= 3.253, p= .001).

Table 34. Motivating Factors as Predictors of Total PA: Multivariate Regression Analysis.

Predictors	Beta	β	t	Semi Partial Correlation
Motivating factors as exercise benefits				
Life Enhancement (8 items)	-.143	-.036	-.412	-.022
Physical performance (8 items)	.120	.026	0.328	.018
Psychological Outlook (6 items)	1.770	.362	4.747**	.248
Social Interaction (4 items)	1.244	.195	3.253**	.173
Health Prevention (3 items)	-.413	-.041	-.701	-.038

** Correlation is significant at p value <.001
Final Model R^2= .222, F= 19.591, p= .000

Among the de-motivating factors, only time expenditure (β= .200, p= .001) and exercise milieu (β= .170, p= .005) were significantly related to total PA. The semi partial

correlation coefficient for exercise milieu as de-motivating factor for exercise was .149 (t= 2.804, p= .005) after controlling for all other de-motivating factors. Likewise, the semi partial correlation coefficient for time expenditure after controlling for other factors was .177 (t= 3.335, p= .001). These values for semi partial correlation coefficients demonstrate their unique contribution to total physical activity of the students while other variables are controlled.

Therefore, the final equations demonstrated overall and semi partial correlations between various motivating and de-motivating factors for exercise rejecting the null hypothesis.

Table 35. De-motivating Factors as Predictors of Total PA: Multivariate Regression Analysis.

Predictors	Beta	β	t	Semi Partial Correlation
De-motivating factors as exercise barriers				
Exercise Milieu (6 items)	.885	.170	2.804**	.149
Time Expenditure (3 items)	1.633	.200	3.335**	.177
Physical Exertion (3 items)	.002	.000	0.006	.000
Family Discouragement (2 items)	.987	.101	1.737	.093
** Correlation is significant at p value <.005				
Final Model R^2= .143, F= 14.354, p= .000				

Research Question 8

What is the relationship between the levels of perceived exercise related self-efficacy and total PA?

Hypothesis 10: There will be no relationship between the levels of exercise self-efficacy and total PA.

Multivariate regression analysis was used to test Hypothesis 10 (Table 35). Total PA score was the dependent variable; the predictors were task, coping, and scheduling self-efficacy. The regression model demonstrated a statistically significant correlation

between total PA and the predictors (36% explained variance, R^2= .361, p= .000). Both coping (β= .230, p= .000) and scheduling self-efficacy (β= .411, p= .000) had statistically significant relationships to total PA. The semi partial correlations coefficient was .215 (t= 4.091, p= .000) for coping self-efficacy and .350 (t= 6.924, p= .000) for scheduling efficacy indicating their unique and statistically significant contribution to PA when other factors were controlled.

Therefore, coping and scheduling self-efficacy made significant contributions to the regression equation in exception to task self-efficacy that was not related to total PA; the null hypothesis was not accepted.

Table 36. Three Types of Self-Efficacy as Predictors of Total PA: Multivariate Regression Analysis.

Predictors	Beta	β	t	Semi Partial Correlation
Task self-efficacy				
Low task self-efficacy	-1.102	-.019	-.391	-.021
Moderate task self-efficacy	-.850	-.026	-.542	-.029
Coping Self-efficacy		.230	4.091**	.215
Scheduling self-efficacy		.411	6.924**	.350

** Correlation is significant with p value <.001,
Final Model R^2= .361, F= 48.496, p= .000

Research Question 9

What are the overall statistically significant predictors of PA?

Hypothesis 11: There will be no significant relationship between PA according to socio-demographic factors, motivating and de-motivating factors, and exercise self-efficacy

Hierarchical linear regression was conducted to determine if socio-demographic factors (age, gender, ethnicity, marital status, employment status, study area, study level, CVD knowledge), motivating and de-motivating factors for exercise/physical activity,

and three types of self-efficacies (task, coping, and scheduling) predicted the total PA level. In order to hold socio-demographic variables constant, they were entered into the model as the first step. Within the theoretical framework, these socio-demographic variables were portrayed as impacting motivating and de-motivating factors, self-efficacy and ultimate PA levels. The outcome of this first step was significant (R^2 =102, F =2.921, p= .000) with level of study, study area (art and sciences), and marital status predicting total PA. This equation explained 10% of the variance of PA.

Exercise motivators (benefits) and de-motivators (barriers) were then entered. Approximately 27% of the variance in PA was explained by this equation; the results were statistically significant (R^2 = .267, F= 8.080, p = .000). There was more than a 2.5 fold increase in the amount of variance explained when motivating and de-motivating factors were added. In this equation, besides art and sciences as study area, level of study, and marital status, motivation score, and demotivation were observed to be the significant predictors of total PA.

Finally, task, coping, and scheduling self-efficacy were entered into the equation. The model was statistically significant (R^2 = .449, F= 14.129, p= .000) The addition of task, coping, and scheduling self-efficacy to the equation increased the amount of variance explained from 26% to 45%. The level of study (β= -.134, p= .002), marital status (β= -.171, p= .000), exercise motivation score (β= .133, p= .010), coping self-efficacy (β= .181, p= .001), and scheduling self-efficacy (β= .347, p= .000) were significantly correlated with total PA level. There were no significant correlations between PA level and any other predictors. Therefore, being married and being a doctoral student predicted lower levels of engagement in PA. Higher levels of exercise motivation,

coping self-efficacy, and scheduling efficacy predicted higher levels of PA. All the significant and non significant correlations between predictor variables and outcome variables in each model are depicted in Table 37.

Summary

The physical activity level of 349 graduate students aged 26 to 59 was examined using various statistical analytical tools. The quantitative analysis conducted within this chapter involved using three established measures to collect primary data: The *Exercise Benefits and Barriers Scale (*EBBS*), Multidimensional Self-efficacy scale (*MSES*), and International Physical Activity Questionnaire (*IPAQ*)* measured the various constructs of physical activity among this population. Physical activity was measured in terms of MET level. The results indicated that the majority of the students engaged in a moderate level of physical activity with a very small percentage engaging in vigorous PA. PA correlates identified for this population included motivators perceived as exercise benefits, coping and scheduling self-efficacy, level of study, and marital status. The results of this study provided the preliminary data that could serve as needs assessment directed toward future research studies designed to further explore the wellness needs of this segment of higher education known as graduate students.

Table 37. Socio-Demographic Variables, Motivating and De-motivating Factors, and Task, Coping and Scheduling Self-efficacy as Predictors of Total PA Level: Hierarchical Regression Analysis.

Variables		Model 1		Model 2		Model 3	
		β	Sig	β	Sig	β	Sig
Age	35-44	.013	.809	.009	.864	.009	.841
	>45	-.032	.550	.006	.899	.036	.402
	Gender	-.096	.082	-.096	.056	-.073	.098
Ethnicity	Hispanic	-.074	.170	-.037	.447	-.010	.817
	African	-.053	.312	-.061	.201	-.051	.219
	American Indian	.064	.224	.066	.167	.058	.165
	Asian	.001	.992	.018	.707	.012	.775
Broader study area	Art and sciences	-.162	.014	-.127	.034	-.078	.139
	Ed. Human Dev.	-.056	.344	-.017	.747	-.008	.863
	Level of study	-.147	.007	-.131	.008	-.134	.002
	Marital status	-.212	.000	-.017	.001	-.171	.000
	Employment status	-.098	.078	-.059	.238	-.079	.075
	Exercise Motivation			.299	.000	.133	.010
	Exercise De-motivation			.177	.002	.071	.165
Task self-efficacy	Moderate					-.012	.799
	Low					-.025	.605
	Coping self-efficacy					.181	.001
	Scheduling self-efficacy					.347	.000
Final Model (R^2= .449, F= 14.129, p= .000)							

CHAPTER V

DISCUSSION AND CONCLUSIONS

The focus of this study was PA behavior and related constructs in regard to graduate students. Detailed results from the statistical analyses were presented in Chapter IV. This discussion section focuses on how the independent variables included in this study autonomously predicted PA behavior. This chapter presents the discussion of the results within the perspective of previous research literature and theoretical frameworks. The results are addressed in terms of the nine research questions grouped into seven specific sections: CVD knowledge, personal health behavior, physical activity, exercise-related self-efficacy, motivating and de-motivating factors for exercise, predictors of PA behavior, and theoretical framework. Limitations experienced during the research and implications for nursing are presented. The chapter concludes with recommendations for future research.

Discussion of the Results/Findings

Students' Self-reported Knowledge about CVD, CVD Risk Factors, and Prevention Practices

The graduate student participants had moderately high to very high levels of knowledge about CVD. They were found to have more knowledge of CVD risk factors than of CVD prevention or various CVD conditions. These findings are somewhat consistent with the documented CVD- knowledge level obtained from studies of undergraduate students and young adult populations.

Although no data is available on the graduate students' knowledge of CVD, as reviewed previously in Chapter II, findings from Vale (2000), Frost (1990), and Romero (2005) provide a useful comparison to the study results. Vale used a representative sample of adolescents and young adults from 19 states in the US and measured their knowledge of CVD risk factors. The sample included adolescents and adults between the ages of 18 and 21. The present study's participants were more knowledgeable about high blood pressure, high cholesterol, and physical inactivity as risk factors for CVD compared to those in Vale's sample. Both groups were equally knowledgeable about smoking as a risk factor. Surprisingly, family history as a risk factor was identified by the majority of Vale's sample, but only a small portion of this current sample identified it as a risk factor.

Frost (1990) also noted the presence of slightly different levels of knowledge of CVD-prevention practices among a sample of university students compared to this current study. Frost's participants were more cognizant about lowering blood pressure, reducing smoking, and controlling cholesterol as CVD-prevention strategies than the participants in this study. However, graduate students of this study were more likely than those in Frost's and Vale's samples to recognize weight reduction and physical activity as key CVD-prevention strategies.

Students' responses regarding their own risk perception of having CVD were consistent with those of two samples of university undergraduates (Collins et al., 2004; Romero, 2005). The majority of the students in the current study perceived themselves to be at low risk of having CVD, with a very small percentage seeing themselves at high

risk. Romero (2005) and Collins et al. (2004) reported that the majority of the students in their studies rated their risk of developing CVD as very unlikely.

The participants used and/or the findings revealed by Vale, Frost, Romero, and Collins et al. are not directly comparable to those in this study due to several factors, including age, education level, and year of study. The latter may reflect greater awareness of exercise and weight reduction as CVD-prevention factors today than 10 or more years ago. It is possible that, across samples, the lack of seeing themselves at risk for developing CVD might be related to their being highly cognizant of CVD-prevention strategies and how those factors constitute risks.

Students' Personal Health Behavior and Body Mass Index (BMI)

Students' BMI

The mean BMI value among students was found to be 26±3.8. Although nearly half the students had BMI values within the healthy range, over 50% were classified as overweight or obese. A greater percentage of female students than male were within the "healthy" BMI range, but the percentages classified as overweight and obese were similar across genders. These rates of being overweight and obesity are consistent with national trends and trends among university undergraduate students. Flegal, Carroll, Ogden, and Curtin (2010) found the rate of obesity to be 27.5% (ages 20–39) and 34.3% (ages 40–59) for men. Women had even higher rates of obesity, 34% (ages 20–39) and 38.2% (ages 40–59). In a cross-sectional study of 1,701 undergraduates, Burke et al. (2009) reported that about one third of their subjects was either overweight or obese. Those students also had subjective signs of metabolic syndrome. Lowry et al. (2000) also discovered that 35% of a representative sample of undergraduates (N=4,609) was overweight or obese.

That the BMI levels for the graduate students in this study fell within the mid-range of previously reported BMI levels for college students is not unexpected in light of increasing obesity rates over time in the general population. It is also consistent with statements that the prevalence of risk factors for CVD is high among university students and graduate students. Thus, the trend found in this sample is congruent with trends within the population as a whole.

Students' Sleeping Behavior

Three quarters of the students had some problem with sleeping or feeling rested during the 30 days prior to participation in this study. Of the students having problems, a significant proportion reported having problem with sleep or rest for seven or more days during that time.

This finding of lack of sleep/rest among graduate students is congruent with previous studies. Some researchers have claimed that college students, including graduate students, are one of the most sleep-deprived groups in the US (Central Michigan University, 2008; Forquer, Camden, Gabriau, & Johnson, 2008; Pallos et al., 2004). This lack of sleep/rest is known to increase students' vulnerability to sleep-related consequences (Forquer et al., 2008). Furthermore, epidemiological studies have demonstrated an association between chronic sleep deprivation and a significant increase in the risk of CV events (Ayas et al., 2003; Liu & Tanaka, 2002). More specifically, a buildup of sleep deprivation over several nights can significantly stress the heart of an individual (Banks, 2007).

Previous studies have reported that as many as 60% of students could be categorized as poor-quality sleepers based on the Pittsburg Sleep Quality Index (PSQI)

(Lund, Reider, Whiting, & Prichard, 2010). These authors reported that many students in their study took prescription, over-the-counter, and recreational psychoactive drugs to alter their sleep/wakefulness. Likewise, Brown et al. (2006) recently reported chronic sleep difficulty to affect approximately 30% of students studied. Students over the age of 22 years were found to have more sleep difficulties than students who were younger than 22 years (Pagel & Kwiatkowski, 2010).

This current study did not explore type and the magnitude of sleep/rest difficulty among study participants. Similarly, no information about student use of prescription or over-the-counter sleep aids was collected. However, looking at the proportion of students having sleep/rest problems, this piece of information seems worth mentioning and an issue worth exploring in the future.

Student Smoking Behavior

Out of the entire sample, only a very small and similar percentage of male and female students identified themselves as smokers; the majority said they were nonsmokers. This percentage is almost identical with the smoking rate reported among undergraduate students (Burke et al., 2009).

Although much lower smoking rates were reported by some (Frost, 1992; Spencer, 2002), the difference may be attributable to the amount of time that has elapsed since their studies. More recently, Berg et al. (2011) highlighted a smoking rate of only 8.3% among four-year college students. Others have reported variations in the rates based on gender, race, and educational status. These age- and education-based findings are congruent with those findings reported in the CDC and Prevention's report on smoking (CDC, 2009). The report clearly identified differences in smoking rates based on

ethnicity and education level. The CDC claimed that the smoking rates among US adults decreased with an increase in educational level; the rate for those with a graduate degree was 5.6%. The smoking rates reported in the general population were 23.5% for men and 17.9% for women compared with 14.5% for Hispanics, 12% for Asians, 23.2% for American Indians/Alaska Natives, 21.3% for African/African Americans, and 22.1% for Caucasians.

More significantly, the smoking rate among graduate students in this study is much lower than the national health objectives for smoking of 12%. This obvious difference could be due to the national tobacco reduction campaign. It also may be due to the impact of higher educational levels of the population studied. It could be due to the fact that the University of North Dakota became a tobacco-free campus in 2007, prohibiting the use of tobacco on all university-owned properties. Such a policy can work if students live, work, and recreate on college campuses (Hahn et al., 2010).

Students' Alcohol-Consumption Status

The majority of the students in this study consumed alcoholic beverages; yet less than 1% indicated that they drank two to three drinks daily. None of the students reported drinking more than three drinks daily. This very low level of drinking is rather an unusual finding for student populations based on the studies carried out among undergraduate students. Binge drinking rates of between 18% and 65% have been noted among university students (Dodds, Al-Nakeeb, Nevill, & Forshaw, 2010; Spencer, 2002). Other than number of drinks per day, no other specific data concerning binge drinking was collected in this study. This was beyond the focus of the study because binge drinking behavior involves amount of drink each day as well as the duration. Older age and

increased awareness of the harm related to drinking may also underlie any difference found between undergraduates and graduate students in drinking behavior.

Students' Fruits and Vegetable Intake Behavior

These graduate students had a lower intake of fruits and vegetables than student populations in previous studies. Almost three quarters of participating students reported eating fewer than three servings while approximately one quarter ate four to eight servings daily. Dodd et al. (2010) reported that a small portion of their study participants consumed five servings of fruits and vegetables every day. Makrides et al. (1998) noted an even lower consumption of fruits and vegetable among their study of participants living in university residences. A similar finding was reported by Debate in 2001. Previous studies acknowledged differences in consumption based on gender and ethnicity, with African American males and females consuming much lower servings compared to Caucasians. No such differences were noted in this study.

National trends agree with findings from all of the studies including the current one; young adults (18–24 years) consume the lowest amount of fruits and vegetables (CDC, 2009). Social marketing studies suggest that food consumption is heavily affected by taste, cost, and convenience (Drenowski & Levine, 2003). Therefore, various factors may have played roles for graduate students' fruit and vegetable consumption behavior in this study, with time constraints being the first factor. Time constraints due to academic load and working and studying simultaneously may have impaired their ability to prepare healthy meals, resulting in the consumption of more easy-to-prepare meals (Chou, Grossman, & Saffer, 2004).

Students' Engagement in Physical Activity

A small fraction of the students engaged in high levels of PA (>1500 MET-min/week), and a significant number of students' engaged in moderate PA (600-1500 MET-min/week). However, less than one quarter remained sedentary, engaging in very low levels of PA (< 600 MET-min/week). Only 11.2% of the students met the USDHHS recommendation for VPA.

The percentage of university students exercising at this level is still higher than reported PA levels for many undergraduate students because the majority of students in previous studies did not engage or maintain PA at the level known to have health benefits (Burke, Reilly, Morrell, & Lofgern, 2009; Irwin, 2007; Lowry, Galuska, Fulton, Wechsler, Kann, & Collins, 2000; Spencer, 2002). Lowry et al. (2000) measured vigorous PA as 20 minutes of designated PA $\geq$ 3 days/week. They reported that 37.6% of their study participants engaged in VPA. According to IPAQ metabolic equivalent criteria, they reported VPA ranges between 480 MET for three days of VPA engagement and 1120 MET for seven days. The finding was well below the range of PA reported in this study. Reported levels of PA have been found to be low for international students; Mazloomi, Hassan, and Ehrampoosh (2005) noted that 35% of health sciences students did not participate in exercise at all despite being knowledgeable about the benefits. Thus, the relatively high level of PA reported by the graduate students in this study is not congruent with reported levels of PA among other university students and young adults. An exception is Leslie et al.'s (1999) study in Australia wherein nearly 60% of the students were sufficiently physically active.

Others have provided insights into discrepancies in the exercise behavior and total PA levels found among a variety of populations. Studies have specifically linked inconvenience and travel-related issues with people's nonexercising behavior. Sallis et al. (1990) reported reduced travel time and traffic-related stresses when people used an exercise facility close to their residence. Therefore, proximity to an exercise facility has shown the potential to reduce psychological and physical barriers to exercise (Reed & Phillips, 2005; Sallis et al., 1990). Convenient access to exercise facilities may encourage "nearby residents to be physically active and support ecological models of PA behavior" (Sallis & Owen, 1999, p. 126).

Congruent with Sallis and Owen's study findings, the relatively high level of exercise behavior found in the present study may be explained by the presence of a well-equipped wellness center instituted in 2006 as part of the Healthy UND 2020 initiative. The purpose of the Healthy UND 2020 initiative was to create a campus wide approach to health and wellness issues among UND students. The presence of high levels of CVD knowledge and greater levels of perceived benefits than barriers may have further encouraged their PA behavior. Students' level of study significantly correlated with PA, and the majority of the students enrolled in master's degree programs tended to be younger and more likely to be single than the doctoral students, and thus they exercised more. Finally, utilization of a convenience sampling method and the presence of a self-explanatory study title may have attracted students who were physically active.

Although the students were moderately physically active, they left room for improvement because the majority did not meet the USDHHS guidelines of 150 min of MPA, and 22% remained completely sedentary.

Students' Perceived Motivating and De-motivating Factors for Exercise and Physical Activity

Graduate students in this study perceived a greater amount of benefits than barriers to exercise and PA. Total PA was statistically correlated with both motivation (exercise benefits) and demotivation (exercise barriers) scores. Students scoring highest on the benefits scale were physically active; those scoring highest on the exercise barriers scale had fewer barriers to exercise and also were physically active. The most important motivators for exercise and PA were physical performance, life enhancement, psychological outlook, and preventive health. These results were consistent with the motivators for PA reported in previous studies. Most of those studies focused on motivators and demotivators for PA among undergraduate students and adults outside of academia (Grubbs & Carter, 2002; McArthur & Raedeke, 2005).

Grubbs and Carter (2002) reported that students' perceived motivators for PA were related to physical performance and appearance. They strongly agreed with statements such as: "Exercise increases my level of physical fitness," "Exercise improves the way my body looks," and "My muscle tone is improved with exercise." These are identical to the statements with which this study's participants strongly agreed.

Beliefs that PA contributes to health and general well-being, that is beliefs within the preventive health domain, were reported as motivators for being active by Tal (1992) and were motivators for PA in this study. Physical fitness, physical outlook, psychological well-being, and preventive health were seen as the critical motivators for PA by student populations globally and also by the participants in this study.

Several researchers have divided motivating factors into intrinsic and extrinsic (McArthur and Raedeke, 2005; Egli, Bland, Melton, & Czech, 2011; Kamarudin &

Omar-Fauzee, 2007). They postulate that demographic variations in the amount of intrinsic and extrinsic motivators may be present. In a sample of 2,199 undergraduates, Egli et al. (2011) stated that male students were highly motivated to exercise by intrinsic factors (strength, competition, and challenge) and females were motivated by extrinsic factors (weight management and physical appearance). No such differences in motivating factors were found in this study.

Social interaction has been found to be an important and strong motivator for PA among undergraduates (Brown, Huber, & Bergman, 2005; Buckworth & Dishman, 1999). It was not found to be an important motivator by the students in this study. Lovell, Ansari, and Parker (2010) also stated that their nonexercising university female students strongly disagreed with a statement related to social interaction that "Exercising increases my acceptance by others." These attitudes may constitute an important difference related to perceived motivating factors based on increased maturity between undergraduates and graduate students.

Physical exertion and time expenditure were seen as demotivating factors for exercise and PA. Lovell et al. (2010) also found physical exertion to be a barrier to exercise; their nonexercising university students were largely concerned that exercise made them tired and fatigued. Brown et al. (2005) reported that participants indicated time constraints as one of the strongest de-motivators for exercise.

Exercise milieu and discouragement were not viewed as de-motivators by the participants in this study. Lovell et al. (2010) also noted that family discouragement was not perceived as a strong de-motivator (relatively low mean of 1.96 out of 4). But, students felt exercise milieu to be one of the important de-motivators as they agreed with

the statement "Places for me to exercise are too far away." In this study however, building of a wellness center as part of Healthy UND 2020 initiative could be the reason why students did not perceive exercise milieu as a de-motivator; for these students well-equipped exercise facilities were readily accessible.

In summary, these graduate students perceived greater amounts of motivation than demotivation for exercising but social interaction was not of critical importance as a motivator. Exercise milieu and family discouragement were not seen as barriers to engaging in exercise and PA. Statistically significant correlation between PA and exercise benefits and barriers strongly supported the hypothesis that students who perceived greater benefits and fewer barriers participated in more exercise and PA.

Task, Coping, and Scheduling Self-efficacy Related to Exercise and PA Perceived by the Students

Exercise-related self-efficacy has consistently and positively been associated with being physically active and remaining active (McAuley et al., 2007). Findings from previous studies support the premise that self-efficacy could be a strong predictor of exercise adherence in university/college students (Sullum, Clark, & King, 2000) and in the general population of varying age with or without illnesses (Jonhston-Brooks, Lewis, & Garg, 2002; Marquez & McAuley, 2006; Anderson et al., 2006; Hays & Clark, 1999; Resnick et al., 2000). Self-efficacy is believed to serve as a positive correlate of PA by boosting people's perceived motivation to exercise.

Levels of coping self-efficacy were statistically correlated with perceived exercise benefits. This supports the idea that increased ability to cope with the challenges in the academic environment is strongly associated with increased perceived benefits and barriers and vice versa. Levels of scheduling self-efficacy were also significantly

corelated to both exercise benefits and barriers. Students with higher levels of confidence in regard to dealing with scheduling issues had higher levels of exercise motivation (high benefits score) and lower levels of demotivation (increased barriers score). Moderate and low levels of task self-efficacy were negatively correlated with exercise, suggesting that those with low to moderate confidence in being able to perform necessary exercise-related tasks were less likely to exercise.

Levels of self-efficacy not only predicted degrees of motivation but also predicted PA behavior. A multivariate regression model demonstrated statistically significant relationships between total PA and coping and scheduling self-efficacy, which predicted 36% of PA behavior. Task self-efficacy was not a significant predictor of total PA.

According to the SCT propositions, negative and positive correlations between self-efficacy and PA indicate that individuals who perceive themselves as highly efficacious entertain high levels of exercise benefits and perceive fewer barriers about the behavior (Bandura, 1997). Congruent with SCT propositions, self-efficacy levels and levels of leisure time PA positively correlated with PA among working individuals (Rabinowitz, Melamed, Weisberg, Tal, & Ribak, 1992). Rabinowitz et al. measured self-efficacy levels with a six-point self-rating from very low to very high addressing confidence to engage in leisure time PA. Chiu (2009) established strong positive correlations with attitude, motivation, self-efficacy, and PA among undergraduates (N =1,352). Associations between self-efficacy and exercise or any correlates of exercise suggest that people with high levels of self-efficacy tend to engage in high levels of PA. Most studies of exercise-related self-efficacy conclude that high levels of motivation produce high levels of self-efficacy resulting in the confidence to exercise satisfactorily.

As suggested by previous studies and verified with current study findings, self-efficacy is a strong predictor of PA motivation and PA itself. Although high levels of task self-efficacy and moderate levels of scheduling efficacy were perceived, the confidence to exercise under challenging situations (coping efficacy) was found to be lacking. Enhancing students' self-efficacy is of critical importance due to its ability to minimize stress and improve perceptions and interpretations of the ability to engage in PA behavior as desired (Bandura, 1997). Schwarzer and Renner (2000) validate this by stating that coping efficacy might be the most critical element of behavioral development.

In summary, to promote people's long-term wellness, it is imperative to develop cognition and beliefs associated with successful behavior change. A university education provides students with the opportunity to grow academically, but may also increase their vulnerability to inactivity and related consequences. Thus, research and practices should focus on the development of self-efficacy beliefs and attitudes.

Predictors of Exercise Behaviors among the Graduate Student Population

The final research question guiding this study addressed the overall statistically significant predictors of PA. Hierarchical linear regression analysis was conducted with socio-demographic variables (age, gender, ethnicity, education level, education area, employment status, and marital status), CVD knowledge, motivation (exercise benefits), demotivation (exercise barriers) for exercise, and exercise-related tasks, coping, and scheduling self-efficacy.

Five variables were significant predictors in the final regression model: level of study, marital status, exercise motivations, coping self-efficacy, and scheduling self-efficacy. Married students had lower levels of PA than did single students, females were

less active than males; perceived levels of exercise motivation, coping self-efficacy, and scheduling self-efficacy predicted higher levels of PA. These findings agreed with those from the previous bivariate and multivariate analyses.

The findings were also consistent with those from a review by Trost, Owen, Bauman, Sallis, & Brown (2002). Their review of more than 300 published articles summarized the major determinants of PA. The review suggested that participation in PA by an adult may be influenced by a range of demographic factors such as age, gender, and education levels, with cognitive/psychological factors such as perceived self-efficacy and perceived benefits having the strongest correlations. Additionally, they found other variables to be the determinants of PA that were not addressed in this study such as socioeconomic status, overweight, obesity, attitudes, intentions, exercise schemata, perceived behavioral control, normative believe psychological health, and stages of changes.

Findings from this study did agree with Sallis and Owen that marital status, level of study, high levels of motivating factors, and self-efficacy strongly predicted PA levels. Knowledge was discounted as a predictor of PA by the Sallis and Owen review and this study.

Discussion of Theoretical Underpinnings

Health Promotion Model and Social Cognitive Theory have been used individually to predict PA behaviors among a range of populations. This study integrated the major constructs of these two theories into a parsimonious model to examine the factors predicting PA for graduate students. Two major factors influencing health-related behavior (PA) derived from the HPM were studied: individual characteristics and

behavior-specific cognition and affect (e.g., perceived benefits to behavior, perceived barriers to behavior, perceived self-efficacy). Pender's HPM argues that the individual's ability to engage in health-promotion activity depends upon those factors along with competing demands for each individual. Interpersonal influences described in the model were measured with perceived benefits and barriers to exercise. The theory states that these constructs ultimately lead to self-efficacy. The HPM and SCT theories both see self-efficacy as the critical element leading to ultimate health-promoting behavior. The health-promoting behavior of interest in this study was total PA. Various aspects of theories were measured using some established and some newly developed measures.

Descriptive statistics for each variable within the theoretical model were individually measured. Such variables included age, gender, ethnic identity, marital status, area and levels of study, CVD knowledge, perceived benefits and barriers to exercise, self-efficacy (coping, task, scheduling), and total PA levels. Furthermore, correlations among these variables were tested with several bivariate and multivariate regression models. Finally, shared ability of all the variables studied to predict the outcome variable was analyzed using hierarchical linear regression.

In accordance with the proposed model, personal factors did not predict behavior-specific cognition but factors within behavior-specific cognition (motivation and demotivation factors and self-efficacy) were strongly intercorrelated. Levels of self-efficacy also predicted the final health-related behavior, PA. Nineteen variables in the model (socio-demographic and cognitive/psychological) together explained a total of 45% of the variance for PA; this is significantly high for social research studies where prediction of human behavior is rather a complex process.

As postulated in the theoretical model, socio-demographic variables and cognitive variables described by the HPM in accordance with Bandura's reciprocal determinism were partially effective in predicting final PA behavior. Motivating and de-motivating factors were found to predict perceived self-efficacy. As explained within the theoretical framework, for an individual to perceive a high level of self-efficacy, perceived motivations must outweigh de-motivations; this was predicted by the model. At the center of the framework, PA was also the major outcome variable. The structure was able to predict that if a student perceives a high level of self-efficacy, he/she will engage more in PA and exercise. If a person does not perceive a high level of self-efficacy due to perceptions of a high level of de-motivating factors, then he/she will not engage in exercise and PA.

Limitations of the Study

Limitations for this research relate to the sample characteristics, instrumentation, data-collection procedures, and dissemination plan. The research used a convenience sample of 349 graduate students. The age of the students varied between 22 and 59 years. The majority of the students were enrolled in masters' degree programs (70%); most (83%) of them were Caucasians; and 63% were females. These sample characteristics limited variability and generalizability of the findings. Consequently, the study findings have limited generalizability to other graduate students. The inclusion of such a large proportion of master's degree students suggests that age differences may be involved in the finding that level of study was a significant predictor of PA. Finally, obtaining subjects from a single university located in a specific geographic region may also affect the generalizability of the findings (Polit & Beck, 2008). In addition, the University of

North Dakota houses a well-equipped wellness center, and student populations at other institutions may not have access to such facilities.

All data in the study were generated with self-report measures, including information about weight, height, and the amount and duration of each type of physical activity the students engaged in during the seven days prior to participation in this study. The use of self-report measures can lead to potential problems with data interpretation and dissemination. The major problem reported with this approach is that study participants could be influenced by social desirability and memory while they complete the survey (Polit & Beck, 2008; Trochim & Donnelly, 2006; Adams et al., 2005). The responses may be vulnerable to students' faking their answers in order to provide a socially desirable response (Burns & Grove, 2005). This could not be controlled by the researcher due to the online nature of the survey.

Physical activity levels in the study were measured using the psychometrically sound *International Physical Activity Questionnaire* (IPAQ). As with other PA questionnaires, the IPAQ has practical value for estimating the magnitude and patterns of PA among populations (Shephard, 2003). Nevertheless, the use of such questionnaires as a self-reported measure of PA has been reported to have a tendency to provide erroneous estimations; Ramírez-Marrero et al. (2008) reported that levels were overestimated among study participants. If feasible, more objective measures of PA could yield more reliable and valid results. Examples of such objective measures are pedometers and/or accelerometers or metabolic biomarkers.

Another limitation to this study involved the absolute lack of reference data with which to compare the findings. References would have been helpful for comparisons of

findings with past situations, in various geographic regions, gender and ethnicity, and master's degree versus doctoral degree students. Most studies were conducted with undergraduates, pediatric populations, or populations with specific illnesses. The results from this study will serve as reference data to compare similar findings for future studies of graduate students.

Implications for Nursing Practice

Nursing is not well informed about the problem of CVD or the prevalence of PA behavior and correlates of PA among the brightest and highest educated citizens of our society. These graduate students are the future leaders in their own communities or professions. This lack of knowledge for the most part is due to lack of research studies carried out among these students. Carper (1978) argued that "Nursing depends on the scientific knowledge of human behavior in health and illness, the esthetic perception of significant human experiences, and a personal understanding of the unique individuality of the self and the capacity to make choices....." (p. 22). Yet, exploring any phenomenon in isolation does not provide a comprehensive picture. This study explored the phenomenon called PA in terms of CVD knowledge, socio-demographic correlates of PA, motivating and de-motivating factors for PA, and exercise-related coping, task, and coping self-efficacy. The findings potentially provide a key research background for promotion of an understanding of the phenomenon of PA in regard to graduate students for nursing. Therefore, this study adds to knowledge development for nursing.

The findings from this dissertation study also highlight the importance of motivating and de-motivating factors for exercise tested within an accepted theoretical framework. This has the potential to promote the development of innovative strategies

designed to encourage PA among graduate students who are sedentary or relatively inactive despite having a well-equipped wellness center within their reach. Multi-dimensional approaches are needed when designing PA-promoting strategies in order to increase perceptions of benefits and decrease perceptions of barriers and to enhance coping and scheduling self-efficacy. An example of one such strategy is a nursing/wellness outreach program that reaches out to physically inactive students beyond the boundary of the wellness center. These outreach programs could be organized through interactive sessions on campus colleges. More opportunities and encouragement need to be provided to married students and/or those enrolled in doctoral programs. Specific strategies that focus on friends, family, and children need to be developed.

Exercise benefits scores strongly predicted self-efficacy and total PA, suggesting that strategies to increase self-efficacy beliefs are imperative. The individualized needs of students or groups need to be considered; each person should be helped to develop realistic goals that fit his/her needs. Incremental steps in a PA plan for the absolutely sedentary student and the development of family inclusion plans are important. A holistic approach to deal with physical inactivity among these students includes the implementation of time management, peer role modeling, continuous feedback, and following strategies to promote self-efficacy (Allen, 2004; Hays & Clark, 1999).

Recommendations for Future Nursing Research

This study provides baseline data for evidence-based approaches to enhance wellness issues among graduate students. Although the study findings were solely based on self-estimates of health-related behavior, the correlates of PA were estimated comprehensively. Limitations that affect generalizability of the findings suggest the need

for further studies that objectively delineate these findings. The study could be replicated solely among non exercisers to address their demotivation for exercise and establish its relationship with a specific type of self-efficacy. A similar approach can be used to study only exercisers to measure their motivation to exercise and self-efficacy. The findings then could be used to develop evidence-based intervention to promote PA.

This study's results distinctly demonstrated that, at least in this population, PA levels are substantively influenced by one's belief in his/her ability to cope with challenging academic situations and deal with scheduling issues. Exercise interventions could focus on the actual/potential relationship between a change in self-efficacy and PA level. Interventions may also be designed to determine a relationship between a change in exercise motivation and PA level over time or during a particular season.

Additionally, the development of an instrument to measure motivating and de-motivating factors for exercise and PA may be desirable. An instrument customized to the needs of the graduate student in the face of changing dynamics such as increasing ethnic and age variations may be time relevant (Snyder, Dillow, & Hoffman, 2009).

To minimize the effects of self-report measures as noted by Ramirez-Marrero et al. (2008), more objective measures of PA could be used in addition to questionnaires. This would increase objectivity of the measurement and help establish concurrent validity among the measurement methods used. Anthropometric measurements such as metabolic biomarkers could also be paired with these subjective measures, providing researchers with more comprehensive knowledge about the students' actual/potential risk of having CVD so that more aggressive interventions could be implemented. Research about PA behavior among students should progress to experimental designs in which interventional

programs can be implemented to enhance students' health-promoting behavior. In addition, a key area for further research is distinguishing between leisure and nonleisure PA in this population.

APPENDICES

Appendix A

University Of North Dakota IRB Approval Letter

UNIVERSITY OF UND NORTH DAKOTA

INSTITUTIONAL REVIEW BOARD
c/o RESEARCH DEVELOPMENT AND COMPLIANCE
DIVISION OF RESEARCH
TWAMLEY HALL ROOM 106
264 CENTENNIAL DRIVE STOP 7134
GRAND FORKS ND 58202-7134
(701) 777-4279
FAX (701) 777-6708
www.und.edu/dept/rdc/regucomm/IRB

December 29, 2010

Bibha Gautam
4901 4th Street #98
Lubbock, TX 79416

Dear Bibha:

We are pleased to inform you that your project titled, "Translation of Cardiovascular Disease Knowledge into Exercise Behavior: Motivational Factors to Exercise Reported by Young Adults Enrolled in Graduate School" (IRB-201012-172) has been reviewed and approved by the University of North Dakota Institutional Review Board (IRB). The expiration date of this approval is November 15, 2011.

As principal investigator for a study involving human participants, you assume certain responsibilities to the University of North Dakota and the UND IRB. Specifically, any adverse events or departures from the protocol that occur must be reported to the IRB immediately. It is your obligation to inform the IRB in writing if you would like to change aspects of your approved project, prior to implementing such changes.

When your research, including data analysis, is completed, you must submit a Research Project Termination form to the IRB office so your file can be closed. A Termination form has been enclosed and is also available on the IRB website.

If you have any questions or concerns, please feel free to call me at (701) 777-4079 or e-mail michellebowles@mail.und.edu.

Sincerely,

Michelle L. Bowles, M.P.A.
IRB Coordinator

MLB/jle

Enclosures

REPORT OF ACTION: PROTOCOL CHANGE

University of North Dakota Institutional Review Board

Date: 2/3/2011 **Project Number:** IRB-201012-172

Principal Investigator: Gautam, Bibha

Department: Nursing

Project Title: Translation of Cardiovascular Disease Knowledge into Exercise Behavior: Motivational Factors to Exercise Reported by Young Adults Enrolled in Graduate School

The above referenced project was reviewed by a Designated Member for the University's Institutional Review Board on 2/4/2011 and the following action was taken:

☐ Protocol Change approved. **Expedited Review** Category No. _____
Next scheduled review must be before: _____

☐ **Copies of the attached consent form with the IRB approval stamp dated _____ must be used in obtaining consent for this study.**

☒ Protocol Change approved. **Exempt Review** Category No. 2
This approval is valid until November 15, 2011 as long as approved procedures are followed.
No periodic review scheduled unless so stated in the Remarks Section.

☐ **Copies of the attached consent form with the IRB approval stamp dated N/A must be used in obtaining consent for this study.**

☐ Minor modifications required. The required corrections/additions must be submitted to RDC for review and approval. **This study may NOT be started UNTIL final IRB approval has been received.**
(See Remarks Section for further information.)

☐ Protocol Change approval **deferred. This study may not be started until final IRB approval has been received.**
(See Remarks Section for further information.)

☐ Protocol Change **disapproved. This study may not be started until final IRB approval has been received.**

REMARKS: **Any unanticipated problem or adverse occurrence in the course of the research project must be reported within 5 days to the IRB Chairperson or RDC by submitting an Unanticipated Problem/Adverse Event Form.**

Any changes to the Protocol or Consent Forms must receive IRB approval prior to being implemented (except where necessary to eliminate apparent immediate hazards to the subjects or others).

PLEASE NOTE: **Requested revisions for student proposals MUST include adviser's signature. All revisions MUST be highlighted.**

☒ Education Requirements Completed. (Project cannot be started until IRB education requirements are met.)

cc: Dr. Bette Ide

Signature of Designated IRB Member — Date
UND's Institutional Review Board

If the proposed project (clinical medical) is to be part of a research activity funded by a Federal Agency, a special assurance statement or a completed 310 Form may be required. Contact RDC to obtain the required documents.

(Revised 10/2006)

REPORT OF ACTION: EXEMPT/EXPEDITED REVIEW

University of North Dakota Institutional Review Board

Date: 12/22/2010 **Project Number:** IRB-201012-172

Principal Investigator: Gautam, Bibha

Department: Nursing

Project Title: Translation of Cardiovascular Disease Knowledge into Exercise Behavior: Motivational Factors to Exercise Reported by Young Adults Enrolled in Graduate School

The above referenced project was reviewed by a designated member for the University's Institutional Review Board on 12/23/2010 and the following action was taken:

☐ Project approved. **Expedited Review** Category No. _____
Next scheduled review must be before: _____

☐ **Copies of the attached consent form with the IRB approval stamp dated _____ must be used in obtaining consent for this study.**

☒ Project approved. **Exempt Review** Category No. 2
This approval is valid until November 15, 2011 as long as approved procedures are followed. No periodic review scheduled unless so stated in the Remarks Section.

☐ **Copies of the attached consent form with the IRB approval stamp dated N/A must be used in obtaining consent for this study.**

☐ Minor modifications required. The required corrections/additions must be submitted to RDC for review and approval. **This study may NOT be started UNTIL final IRB approval has been received.**

☐ Project approval **deferred. This study may not be started until final IRB approval has been received.**
(See Remarks Section for further information.)

☐ Disapproved claim of exemption. This project requires Expedited or Full Board review. The Human Subjects Review Form must be filled out and submitted to the IRB for review.

☐ Proposed project is not human subject research and does not require IRB review.
☐ Not Research ☐ Not Human Subject

PLEASE NOTE: Requested revisions for student proposals MUST include adviser's signature. All revisions MUST be highlighted.

☒ Education Requirements Completed. (Project cannot be started until IRB education requirements are met.)

cc: Dr. Bette Ide

Michelle L. Bohn 12/23/2010
Signature of Designated IRB Member Date
UND's Institutional Review Board

If the proposed project (clinical medical) is to be part of a research activity funded by a Federal Agency, a special assurance statement or a completed 310 Form may be required. Contact RDC to obtain the required documents.

(Revised 10/2006)

Appendix B

Survey Questionnaire

Translation of CVD Knowledge into Exercise Behavior: Motivational Factors

Translation of CVD Knowledge into Exercise Behavior: Motivational Factors

1. Subject Disclosure Statement

Title of the project: Translation of CVD Knowledge into Exercise Behavior and Motivation toward Exercise among Graduate Students.

You are being invited to voluntarily participate in this research study because you are a full-time graduate student at the University of North Dakota. The purpose of the study is to explore the relationships between graduate students' self reported knowledge about cardiovascular disease (CVD) and their prevention practices.

If you agree to complete this online survey by clicking the button below, you will be required to answer questions about CVD knowledge, personal health behavior, physical activity behavior, perceived self efficacy, your motivations and de-motivations for physical activity, and demographic information. You are not required to disclose any of your personal information including your name. The answers you provide will remain anonymous. As a responding graduate student, you will be assigned a unique code that allows the research team to match your answers over time while maintaining anonymity. The results of this study will only be reported in grouped format.

There are no known risks associated with your participation in this study and no direct benefit from your participation is expected. There is no cost to you except 15-20 minutes of your time. Upon receipt of the completed survey, if you choose, your email address will be entered in a drawing for a chance to win one of two 4th Generation Apple iPod Touch.

The Principal Investigator is Bibha Gautam, RN, a PhD nursing student at the University of North Dakota. Only Ms. Gautam and her advisor will have access to the information collected. In order to maintain your confidentiality, you will not be asked to write your name and or any other personal identifier. Completed surveys will be kept in a locked cabinet in the PI's office and all electronic data will be kept in a password-protected computer.

If you need further information about this study, I, the Principal Investigator, can be contacted anytime during or after the study at 808-831-3515. You can also contact my Dissertation Project Chair, Dr. Bette Ide at 701-777-4531 with questions. If you have any questions concerning your rights as a research subject, have concerns or complaints, and wish to speak with someone who is unaffiliated with the research project, you may call the University of North Dakota Institutional Review Board at 701-777-4279. All calls will remain confidential.

By completing this survey, you are giving permission for the investigator to use your information for research proposes in a way that you will not be harmed.

*** 1. Do you wish to participate in this study**

- ◯ Yes, I wish to participate in the study.
- ◯ No, I do not wish to participate in the study

Translation of CVD Knowledge into Exercise Behavior: Motivational Factors

2. Cardiovascular Disease Knowledge

The following four (4) questions will address your current knowledge of cardiovascular disease (CVD), common risk factors for CVD, commonly utilized prevention approaches, and your perception of having CVD. Please do not look it up because this is not a test.Please select exact number of response as asked in the questions.

*** 2. From the list below, select four (4) conditions that you think are considered as cardiovascular diseases (CVD).**

- [ ] Severe anemia
- [ ] Heart attack
- [ ] High cholesterol
- [ ] Stroke
- [ ] Diabetes
- [ ] Heart failure
- [ ] Peripheral vascular disease
- [ ] Heart rhythm disorder
- [ ] High blood pressure

Other (please specify)

Page 2

Translation of CVD Knowledge into Exercise Behavior: Motivational Factors

3. Cardiovascular Disease Knowledge

*** 3. From the list below, select Five (5) commonly reported risk factors for cardiovascular diseases (CVD).**

- [ ] Diabetes
- [ ] Underweight
- [ ] High blood pressure
- [ ] Eating too much shellfish
- [ ] Low blood pressure
- [ ] High cholesterol
- [ ] Thyroid disease
- [ ] Low cholesterol
- [ ] Overweight
- [ ] Family history of CVD
- [ ] Physical inactivity
- [ ] Too much exercise
- [ ] Smoking
- [ ] Any type of cancer

Other (please specify)

Page 3

Translation of CVD Knowledge into Exercise Behavior: Motivational Factors

4. Cardiovascular Disease Knowledge

*** 4. From the list below, select five (5) commonly utilized specific strategies to prevent cardiovascular diseases (CVD).**

- [ ] Maintaining ideal weight
- [ ] Controlling blood cholesterol to keep it <200 mg/dl
- [ ] Controlling your family history of CVD
- [ ] Taking multivitamins regularly
- [ ] Avoiding exercising in cold weather
- [ ] Engaging in regular physical activity and exercise
- [ ] Controlling blood pressure if it is elevated 10 points above normal
- [ ] Quitting smoking
- [ ] Controlling blood pressure if it is elevated 20 points above normal
- [ ] Drinking adequate water and fluids
- [ ] Controlling blood cholesterol to keep it <250 mg/dl
- [ ] Eating food high in vitamin C
- [ ] Controlling blood glucose if you are diabetic
- [ ] Eating diet high in calcium and other minerals

Other (please specify)

Page 4

Translation of CVD Knowledge into Exercise Behavior: Motivational Factors

5. Cardiovascular Disease Knowledge

* 5. What do you think is your level of heart disease risk?

[Please select one (1) answe]

- ◯ Low risk
- ◯ Moderate risk
- ◯ High risk

6. Cardiovascular Disease Knowledge

* 6. Why did you choose this CVD risk level?

7. Personal Health Behaviors

* 7. What is your current smoking status?

- ◯ Current smoker
- ◯ Never smoker
- ◯ Ex-smoker

8. Personal Health Behaviors

* 8. If you are a current smoker, how long have you been smoking?

(Please select the appropriate response from the list below)

- ◯ Less than 1 year
- ◯ 1-3 years
- ◯ 4-6 years
- ◯ 7-10 years
- ◯ More than 10 years

9. Personal Health Behaviors

* 9. How many cigarettes do you smoke in a day?

- ◯ 1-3 cigarettes
- ◯ 4-6 cigarettes
- ◯ 7-9 cigarettes
- ◯ 10 cigarettes or more

10. Personal Health Behaviors

* 10. Do you currently consume alcoholic beverages?

- ◯ Yes
- ◯ No

11. Personal Health Behaviors

* 11. If you currently consume alcoholic beverages, what length of time have you consumed alcoholic beverages?

- ◯ Less 1 year
- ◯ 1-2 years
- ◯ 3-5 years
- ◯ Longer than 5 years

12. Personal Health Behaviors

* 12. If you currently consume alcoholic beverages, how often do you drink?

One (1) drink is equal to:

- **One (1) 12-aunce bottle of beer**
- **One (1) 4-aunce glass of wine**
- **One (1) aunce of 100 proof spirits(50% alcohol)**
- **1.5 aunces of 80 proof spirits(40% alcohol)**

PLEASE SELECT ONLY ONE RESPONSE

	0 to 1 drink	2 to 3 drinks	4 or more drinks
Daily	◯	◯	◯
Weekly	◯	◯	◯
Monthly	◯	◯	◯

13. Personal Health Behaviors

* 13. During the past 30 days, have you felt you did not get enough rest or sleep?

- ◯ Yes
- ◯ No

14. Personal Health Behaviors

* 14. You felt that you did not get enough sleep or rest during past 30 days.

From the options below, please select the range of numbers that closely matches the number of days that you felt you did not get enough sleep or rest.

- ◯ 1-2 days
- ◯ 3-4 days
- ◯ 5-6 days
- ◯ 7 days or more

15. Personal Health Behaviors

* 15. How many servings of fruits and vegetables do you eat every day?

One serving size equals to:

- 1 medium-size fruit (size of a baseball)
- 1 cup of raw leafy vegetables (about the size of a small fist)
- 1/2 cup fruit or vegetable juice
- 1/2 cup of other vegetables
- 1/2 cup chopped, cooked or canned fruit

Select serving/servings of fruits and vegetable you consume in a day.

- ◯ 0 - 1 serving
- ◯ 2 - 3 servings
- ◯ 4 - 5 servings
- ◯ 6 - 7 servings
- ◯ 8 servings or more

16. Physical Activity/Exercise

*** 16. Think about all the vigorous physical activities that you did in the last 7 days. Vigorous physical activity refers to activities that take hard, physical effort and make you breathe much harder than normal.**

Think only about those physical activities that you did for at least 10 minutes at a time.

During the last 7 days, on how many days did you do vigorous physical activities?

VIGOROUS ACTIVITIES ARE:

Heavy lifting, digging, aerobic dance, aerobic exercise, fast bicycling, jump roping, swimming, singles tennis, Soccer, field or ice hockey, basketball, cross-country skiing.

- ◯ 1 day
- ◯ 2 days
- ◯ 3 days
- ◯ 4 days
- ◯ 5 days
- ◯ More than 5 days
- ◯ No Vigorous Physical Activity

17. Physical Activity/Exercise

*** 17. If you did vigorous physical activity, how much time did you usually spend doing those physical activities on one of those days?**

	Please Select One
Total time spent doing vigorous physical activities in one day	

18. Physical Activity/Exercise

* **18. Think about all the moderate activities that you did in the last 7 days. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.**

Think only about those physical activities that you did for at least 10 minutes at a time.

During the last 7 days, on how many days did you do moderate physical activities?

MODERATE PHYSICAL ACTIVITIES ARE:

Carrying light loads, bicycling at a regular pace, doubles tennis, ice-skating, roller-skating, horseback riding, playing Volleyball, badminton, and mowing the lawn.

DO NOT INCLUDE WALKING.

- ◯ 1 day
- ◯ 2 days
- ◯ 3 days
- ◯ 4 days
- ◯ 5 days
- ◯ More than 5 days
- ◯ No moderate physical activity

19. Physical Activity/Exercise

* **19. If you did moderate physical activities, how much time did you usually spend doing those physical activities on one of those days?**

Please Select One

Total time spent doing moderate physical activity in one day. [ ]

20. Physical Activity/Exercise

*** 20. Think about the time you spent walking in the last 7 days. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.**

During the last 7 days, on how many days did you walk for at least 10 minutes at a time?

- ◯ 1 day
- ◯ 2 days
- ◯ 3 days
- ◯ 4 days
- ◯ 5 days
- ◯ More than 5 days a week
- ◯ No Walking

21. Physical Activity/Exercise

*** 21. If you walked, how much time did you usually spend walking on one of those days?**

This includes walking at work and at home, walking to travel from place to place, and any other walking that you did solely for recreation, sport, exercise or leisure.

Please Select One

Total time spent walking in one day ☐

22. Physical Activity/Exercise

*** 22. The last question is about the total time you spent sitting on weekdays during the last 7 days. Include time spent at work, at home, while doing course work and during leisure time.**

This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

During the last 7 days, how much time did you spend sitting on a week day?

Please Select One

Total hours spent sitting on a weekday during last 7 days ☐

23. Exercise Related Self-Efficacy

A number of situations are described below that can make it hard to stick to exercise regularly. On the items below, please rate your confidence that you can perform exercise on a regular basis (at least 5 days a week). Please rate your degree of confidence by recording in each of the blank spaces a number from 0 to 100 using the scale below.
0 ..... 10 .. .. 20 ..... 30 ..... 40 = Cannot do at all
50 ..... 60 ..... 70 ..... 80 ..... 90 = Moderately Certain
100 = Certain can do

*** 23. By checking a bubble corresponding to a number from 0 to 100, RATE YOUR DEGREE OF CONFIDENCE to do the following:**

	0	10	20	30	40	50	60	70	80	90	100
1. To exercise when you feel discomfort.	○	○	○	○	○	○	○	○	○	○	○
2. To exercise when you lack energy.	○	○	○	○	○	○	○	○	○	○	○
3. To exercise when you don't feel well.	○	○	○	○	○	○	○	○	○	○	○
4. To complete your exercise using proper technique.	○	○	○	○	○	○	○	○	○	○	○
5. To follow directions to complete exercise.	○	○	○	○	○	○	○	○	○	○	○
6. To perform all of the required movements.	○	○	○	○	○	○	○	○	○	○	○
7. To include exercise in your daily routine.	○	○	○	○	○	○	○	○	○	○	○
8. To consistently exercise five times per week.	○	○	○	○	○	○	○	○	○	○	○
9. To arrange your schedule to include regular exercise.	○	○	○	○	○	○	○	○	○	○	○

24. Motivation and De-motivation for Exercise and Physical Activity

EXERCISE BENEFITS/BARRIERS SCALE
Below are statements that relate to ideas about exercise. Please indicate the degree to which you agree or disagree with the statements by circling SA for strongly agree, A for agree, D for disagree or SD for strongly disagree.

*** 24. The following factors related to everyday life encourage or discourages me to engage in moderate intensity exercise for 30 minutes at least 5 times a week**

SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree

	SA	A	D	SD
1. I enjoy exercise.	○	○	○	○
2. Exercise decreases feelings of stress and tension for me.	○	○	○	○
3. Exercise improves my mental health.	○	○	○	○
4. Exercise takes too much of my time.	○	○	○	○
5. I will prevent heart attacks by exercising.	○	○	○	○
6. Exercise tires me.	○	○	○	○
7. Exercise increases my muscle strength.	○	○	○	○
8. Exercise gives me a sense of personal accomplishment.	○	○	○	○
9. Places for me to exercise are too far away.	○	○	○	○
10. Exercising makes me feel relaxed.	○	○	○	○
11. Exercising lets me have contact with friends & persons I enjoy	○	○	○	○
12. I am too embarrassed to exercise	○	○	○	○
13. Exercising will keep me from having high blood pressure.	○	○	○	○
14. It costs too much to exercise.	○	○	○	○

25. Motivation and De-motivation for Exercise and Physical Activity

CONTD.....

EXERCISE BENEFITS/BARRIERS SCALE
Below are statements that relate to ideas about exercise. Please indicate the degree to which you agree or disagree with the statements by circling SA for strongly agree, A for agree, D for disagree or SD for strongly disagree.

*** 25. The following factors related to everyday life encourage or discourages me to engage in moderate intensity exercise for 30 minutes at least 5 times a week**

SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree

	SA	A	D	SD
15. Exercising increases my level of physical fitness.	○	○	○	○
16. Exercise facilities do not have convenient schedules for me.	○	○	○	○
17. My muscle tone is improved with exercise.	○	○	○	○
18. Exercising improves functioning of my cardiovascular system.	○	○	○	○
19. I am fatigued by exercise	○	○	○	○
20. I have improved feelings of well being from exercise.	○	○	○	○
21. My Spouse(or significant other) does not encourage exercising.	○	○	○	○
22. Exercise increases my stamina.	○	○	○	○
23. Exercise improves my flexibility.	○	○	○	○
24. Exercise takes too much time from family relationships.	○	○	○	○
25. My disposition is improved with exercise.	○	○	○	○
26. Exercising helps me sleep better at night.	○	○	○	○
27. I will live longer if I exercise.	○	○	○	○
28. I think people in exercise clothes look funny.	○	○	○	○

26. Motivation and De-motivation for Exercise and Physical Activity

CONTD.....

EXERCISE BENEFITS/BARRIERS SCALE

Below are statements that relate to ideas about exercise. Please indicate the degree to which you agree or disagree with the statements by circling SA for strongly agree, A for agree, D for disagree or SD for strongly disagree.

*** 26. The following factors related to everyday life encourage or discourages me to engage in moderate intensity exercise for 30 minutes at least 5 times a week**

SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree

	SA	A	D	SD
29. Exercise helps me decrease fatigue.	◯	◯	◯	◯
30. Exercising is a good way for me to meet new people.	◯	◯	◯	◯
31. My physical endurance is improved by exercising.	◯	◯	◯	◯
32. Exercising improves my self-concept.	◯	◯	◯	◯
33. My family members do not encourage me to exercise.	◯	◯	◯	◯
34. Exercising increases my mental alertness.	◯	◯	◯	◯
35. Exercise allows me to carry out normal activities without becoming tired.	◯	◯	◯	◯
36. Exercise improves the quality of my work	◯	◯	◯	◯
37. Exercise takes too much time from my family responsibilities.	◯	◯	◯	◯
38. Exercise is good entertainment for me.	◯	◯	◯	◯
39. Exercising increases my acceptance by others.	◯	◯	◯	◯
40. Exercise is hard work for me.	◯	◯	◯	◯
41. Exercise improves overall body functioning for me.	◯	◯	◯	◯
42. There are too few places for me to exercise.	◯	◯	◯	◯
43. Exercise improves the way my body looks.	◯	◯	◯	◯

27. Motivation and De-motivation for Exercise and Physical Activity

*** 27. Here are additional ideas about exercise and physical activity that may apply to you as a graduate student.**

Please indicate the degree to which you agree or disagree with the statements by clicking the corresponding bubble.

SA = Strongly Agree, A = Agree, D = Disagree, SD = Strongly Disagree

	SA	A	D	SD
Exercise takes too much time from my school work	◯	◯	◯	◯
I feel overwhelmed and stressed to exercise	◯	◯	◯	◯

Other (please specify)

28. Personal/Demographic Information

*** 28. What is your academic area of study that you are currently enrolled in?**

Select One

Academic area that I am currently enrolled in:

29. Personal/Demographic Information

*** 29. Your current level of study that you are enrolled in.**

- ◯ Masters
- ◯ Doctorate

30. Personal/Demographic Information

*** 30. What is your age as of your last birth day?**

Select your age

AGE as of last birthday

31. Personal/Demographic Information

*** 31. Your gender**

- ◯ Male
- ◯ Female

32. Personal/Demographic Information

*** 32. What is your ethnicity?**

- ◯ Caucasian
- ◯ Hispanic/Latino
- ◯ African American
- ◯ American Indian/ Alaskan Native
- ◯ Asian/ Pacific Islander

Other (please specify)

33. Personal/Demographic Information

*** 33. What is your current Height?**

Height in feet/inches — Select your height

34. Personal/Demographic Information

*** 34. What is your current weight in pounds?**

For Example: if your current weight is 158 pounds then select 1 from hundredth row, 5 from tenth row, and 8 from ones row.

	0	1	2	3	4	5	6	7	8	9
Hundredth Row	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Tenth Row	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
Ones Row	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

35. Personal/Demographic Information

*** 35. What is your marital status?**

- ◯ Married
- ◯ Divorced/separated
- ◯ Never married

36. Personal/Demographic Information

*** 36. Are you currently living with family?**

- ◯ Yes
- ◯ No

37. Personal/Demographic Information

*** 37. What is your current employment status?**

Employment includes personal business and part time employment, GTA, GSA, GRA.

- ◯ Employed
- ◯ Unemployed

38. Personal/Demographic Information

*** 38. Your current household income?**

- ◯ Less than $ 10,000
- ◯ $ 10,000 - 20,000
- ◯ $ 20,000 - 30,000
- ◯ More than $30,000

39. Appreciation Page

YOU HAVE COMPLETED THE SURVEY

Thank you very much.

We greatly appreciate you for your time and effort to complete the survey.

If you are one of the winners of two 4th Generation iPod Tocuh, you will be notified via email by May 15, 2011.

Appendix C
Permission to Use Exercise Benefits and Barriers Scale

BERLIN SECHRIST ASSOCIATES

January 11, 2011

Bibha Gautam, RN, BSN, PhD Candidate
College of Nursing
University of North Dakota
Grand Forks, ND

Dear Bibha Gautam:

We received your agreements regarding use of the Exercise Benefits/Barriers Scale (EBBS). You have our permission to use the EBBS in your dissertation research titled, *Translation of Cardiovascular Disease Knowledge into Exercise Behavior: Motivational factors to Exercise Reported by Young Adults Enrolled in Graduate School.* If you need to include a copy of the EBBS in an appendix in your dissertation, you have our permission to do so as long as the copyright statement appears at the bottom of the EBBS.

Sincerely,

Karen R. Sechrist, PhD, RN
for Sechrist/Walker/Pender

18 Morning Star · Irvine, CA 92603-3745 · (949) 854-7167 · (949) 854-8532 (FAX) · krsech@pacbell.net

Appendix D
Permission to Use Multidimensional Self-efficacy Scale

Subject: **RE: Requesting a permission to use the "Multidimensional Self-Efficacy for Exercise Scale (MSES)"**
To: "Gautam,Bibha" <bibha.gautam@und.edu>

Date: 01/07/11 04:03 PM
From: Wendy Rodgers <wendy.rodgers@ualberta.ca>

Hello – thank you for your note. I am very pleased that you wish to use the MSES in your research. You do not actually need my permission since the instrument is published in that RQES article, but I like knowing that people are interested in it! Best of luck with your research.

Wendy Rodgers

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